December 1963

culture

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The Slurry Chore . . . . . *A. J. Quick*

Warmth and Safety for Piglets . . . . . *Nigel Harvey*

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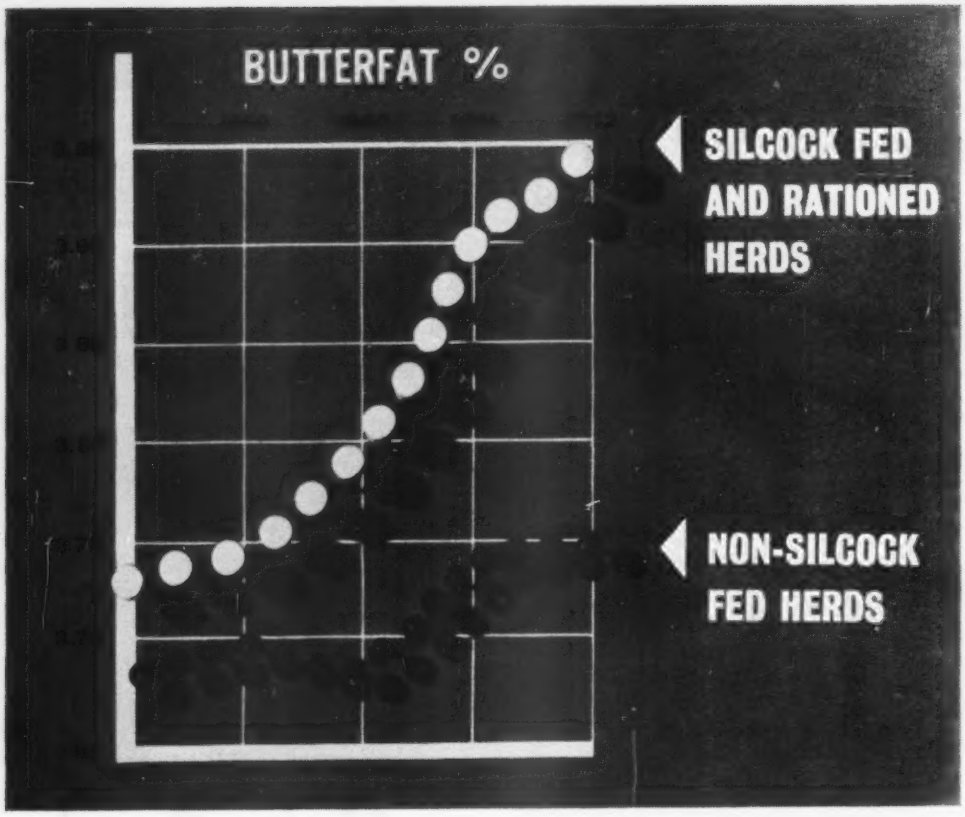

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Agriculture

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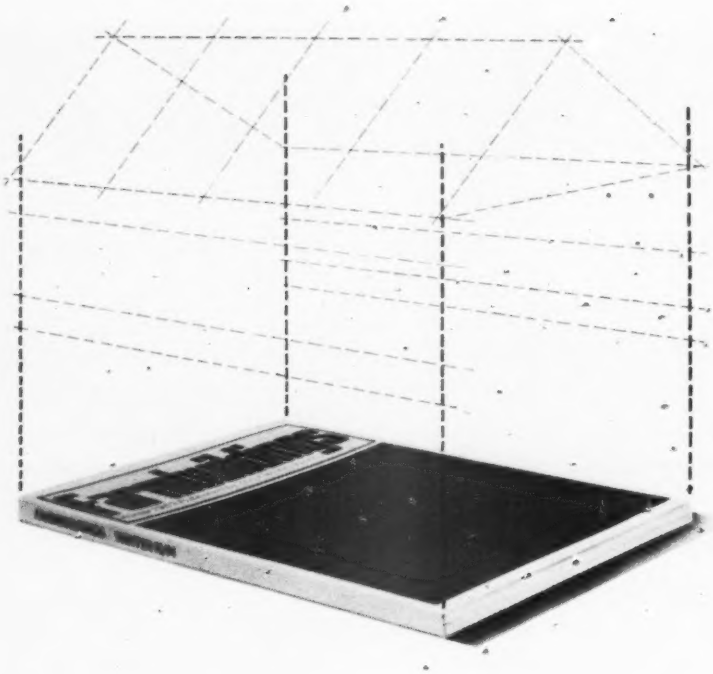

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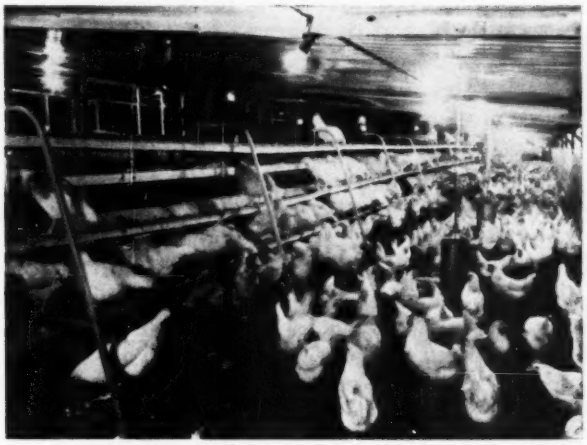


Conventionally lighted poultry house. The unshielded bare lamps give a poor penetration under obstacles

No Shadows in the Poultry House

ALTHOUGH everyone is agreed that electric lighting makes egg production more profitable, it is only quite recently that there has been any agreement on the best level of illumination. Too much is not only wasteful, but may be positively detrimental; too little may be unproductive. In a paper, given jointly with the author at the 1962 Winter Conference of the Farm Buildings Association, Mr. S. Fox, of Reading University, gave an expert's assessment of the optimum illumination for layers, namely $\frac{1}{2}$–2 foot candles on suggested requirements, as follows:

Either (*a*) from 6 hours daily extending by 20 min per week up to 18 hours daily, then held constant at 18 hours.

or (*b*) 6 hours daily for 22 weeks, increase abruptly to 10 hours and then increase gradually to 18 hours as in (*a*).

Getting the right illumination (i.e., very low, but uniform) is an interesting problem. 15 watt or 25 watt lamps

spaced up to 15 ft apart will give the total amount of light required, but unfortunately no way has been discovered of spreading this light evenly over the floor. In practice, the light received by the birds would vary enormously, some getting more than is good for them and others getting too little.

One answer to the problem is simply to whitewash the ceiling and walls liberally. This will redirect upward light from lamps downwards and sideways, giving a very even spread over the whole area and hence reduce the variation between light and dark areas. I would add the possibility of directing *all* the lamp light to the ceiling, and so lighting the entire house by reflection from it. This may not be efficient in the accepted sense of the word but uniform, shadow-free lighting, such as this arrangement gives, is perhaps the only way to give *all* the birds a similar dosage of light.

If you want to give this method a trial, 60 watt bowl mirrored lamps (i.e., the lower half of the bulb is silvered internally) are available. These lamps should be suspended as *low* as is practicable and spaced 12–15 ft apart in all directions. The house interior should be painted white or whitewashed. No shades are required; the silvering shields the filaments from view. This kind of lighting is more expensive than using, say, 25 watt bare lamps but it is still a very small proportion of the overall cost of egg production, and the following advantages can be expected: (1) the lighting is almost shadow-free; (2) uniformity of illumination ensures that all birds receive equal dosage; (3) due to the high diffusion of the lighting it is difficult to obstruct it, i.e., it has high penetration into cages, etc.—even battery houses should present no problem with indirect lighting, although for this type of house the lamp spacing may well be reduced; (4) because there is absolutely no glare, even the small amount of light provided is ample for stock management, and (5) individual lamp failures do not produce patches of darkness, as happens with direct lighting.

As an alternative to a 'grid' pattern of lamps, use may be made of the extra ridge height, suspending higher wattage lamps (say 100 watt) along the ridge line at shorter distances. As a guide to the number and wattage of lamps required, allow for a total lamp wattage in the house equal to half the floor area.

One of the difficulties of using filament lamps for egg production is their relatively short life of 1,000 hours, which means that lamps may have to be changed quite frequently. One way to overcome this difficulty is to use the lamps on a supply voltage which is lower than their official rated voltage: for instance, if the supply voltage is 240 use lamps of 250 volt rating, and for other supply voltages use lamps of the next higher voltage rating. This, of course, will reduce the lamp light output and may need to be compensated for by closer lamp spacing. Lamp life will, however, be much longer. It should be emphasized that this expedient is only recommended in special circumstances such as poultry production lighting.

W. Robinson, B.Sc. (Tech.), A.M.I.E.E., F.I.E.S.,
of the British Electrical Development Association

Heredity and Fertility in Sheep

H. P. Donald

Director
A.R.C. Animal Breeding
Research Organisation

THE cult of fertility in our sheep flocks is very popular nowadays. It comprehends many diverse practices intended to promote the natural increase of ewes and the financial rewards of their owners. Since the level of fertility is widely influenced by, among other things, health, nutrition, light, and heredity, it is not surprising that various methods of manipulating them to advantage have been developed. A few of these methods will be discussed here, principally those connected more or less closely with heredity.

Heredity *v.* environment

Such an arbitrary way of reducing the scope of this article until it will fit into the allotted space should not mislead anyone into thinking that it has any biological merit. The genetical aspects of fertility should not be thought of separately from the environmental aspects. On a hill grazing, 100 Swaledale ewes may produce a mere 80 weaned lambs. To try to improve this by breeding would be an extremely slow, if not quite futile, proceeding. More plentiful and more nutritious food would probably produce better results very quickly. Swaledale sheep are in fact genetically highly fertile already but they need adequate food to show it.

At the other nutritional extreme there are flocks enjoying a standard of living so high that still better feed would achieve no improvement in fertility. Only the development of genetically more fecund animals could exploit the food resources available. This point will arise again later in connection with the creation of new types of sheep adapted to intensive production. Between these two extremes the relative importance of heredity and environment varies with circumstances.

The art of good sheep husbandry is the manipulation of all the many factors in order to produce the desired number of lambs. Nobody really knows what the optimum number is for any given farm, but it is commonly supposed to be higher now than it has been in the past. On many farms it may actually be lower. Economically, it might be better to have fewer lambs, provided they go fat to the butcher off their mothers, or to keep more ewes in lower condition, or to breed them for an early lamb market. Alternatively, one might ask about the economics of controlling the physiological aspects of fertility by using vasectomized rams, by flushing, by varying the hours of darkness, by hormone injections. There is no single or simple answer valid for all flocks or in any one flock.

It is possible to bring about changes in fertility of the order of 20 per cent just by raising or lowering the live weight of ewes, especially the youngest ones, before tupping through fairly minor adjustments to flock management. Whether or not these changes ought to be made is a question that usually turns on costs more than on husbandry. Sometimes this approach is too narrow. Mating techniques that require some outlay in trouble and facilities may be rewarding to a breeder who looks beyond next year's profit-and-loss account. Hand mating, for instance, although it may increase conception rate and concentrate lambing, may pay for itself only through the long-term benefits of progeny-testing.

Breeding for twins

Many breeders are firmly convinced that they can improve the fertility of their flocks by selecting breeding animals that were themselves born twin or produced more than the average number of twin lambs. Geneticists have not been inclined to dispute this, but think that in many cases the rate of progress would be far less than expected. Instead of raising fertility by, say 5 per cent a year, a breeder might achieve only 1 per cent a generation, that is, every 3–4 years. This would scarcely justify the effort and the necessary neglect of other characters. Only an optimist could progeny-test rams with a view to making selection more effective on the male side, even assuming that the tests are prolonged to cover the breeding performance of their daughters.

The reason for this pessimistic view is that in all mammals fertility (as measured by the number of young born or weaned) usually shows, after study of herd and flock records, only a small variation due to heredity. The fundamental fact about heredity is that it makes related animals more alike than unrelated ones are. But as far as fertility is concerned this is only true to a very slight extent. When a breeder claims to have improved his flock rapidly in this character, he is rarely in a position to demonstrate that he did not improve the management or health of his sheep at the same time.

In spite of what has just been said, however, it is obvious that in some circumstances heredity has an important influence. Inbreeding quickly depresses fertility. It is inescapable, therefore, that ordinary levels of fertility in the purest of pure breeds depend heavily on the sort of diversity in genetic constitution that is associated with crossbreeding. All pure breeds studied so far show a low but steady rate of inbreeding and are thus likely to suffer a slow erosion of fertility unless the process is counteracted by some selection in favour of fertility.

Dorset Horn and triplets by a Finnish Landrace ram

It is also obvious that there are breed differences in fertility. How much of the difference between two breeds is genetic in origin is difficult to say without running the two together for some time. Where this has been done (as with Southdown, Welsh Mountain and S.C. Cheviot) clear breed differences are found. Where it has not been done (as with Blackface and Border Leicester) it is not possible to say which breed has the higher fertility.

In the past two basic ways of making good use of genetic differences in fertility have been evolved—and they are still the only ways known. One is selection and the other crossbreeding (or some combination of the two).

The outlook for those breeders who wish to apply selection is not as gloomy as it was. Recent work in Australia and at the Animal Breeding Research Organisation has brought out the interesting point that the difference between one lamb and two lambs may be inherited, while the difference of the same size between no lamb and one lamb is not. If this view is correct a breeder ought to ignore barren ewes and concentrate on multiplying twin-bearers at the expense of single-bearing ewes. In most cases he does this now. The heritability of the difference between one and two lambs is apparently higher than that which is calculated from all ewes, including those which are barren, and so progress should be quicker. How much attention should be paid to triplets is a question still to be answered.

Crossbreeding

Crossbreeding is a very old practice with various components. What part of the advantage comes from breeding an intermediate type of sheep from two contrasting parental types, and what part from hybrid vigour is difficult to say. On theoretical grounds the fertility of a crossbred would be expected to exceed the average of the two parental types. If these are similar in fertility, the crossbreds ought to be better than either. Blackface × Swaledale crossbred ewes have in fact shown some hybrid vigour in mature ewes of the order of a 10 per cent increase in number of lambs weaned. Since the relevant experiment was done under conditions permitting relatively high levels of fertility, the extra lambs appeared as twins. In view of what has been said above, it would be interesting to know if this hybrid vigour would reduce barrenness on hill farms normally experiencing a good deal of it.

In October, 1947, Mr. T. B. Manson described in *Scottish Agriculture* a large trial at New Galloway, Kirkcudbrightshire, involving these two breeds and reported good results on fertility but made no specific mention of barrenness. Under hill conditions extra vigour in lambs and extra fertility in ewes might be useful results of a crossbreeding policy. There is no problem about replacements, provided the old technique of using crossbred ewes for breeding with rams first of one breed, then of the other, is followed.

Two breeds of sheep are credited with outstanding fertility—the Finnish Landrace and the Russian Romanov breeds. A recent importation of the Finnish sheep has been made by A.B.R.O., including one ram from a litter of seven and another from a litter of six lambs. Shortly after arrival here the five ewe lambs and five gimmers were bred and produced 28 lambs, thus quickly making good their claim to high fertility.

The question now to be answered is whether this character can be transmitted, at least in part, to crossbreds and combined eventually with the superior meat characteristics of some British breeds such as the Dorset Horn.

As sheep production intensifies, more and more breeders are inquiring how best to increase fertility, and research is aimed at obtaining answers to some of their questions. There is much to be said for taking short cuts wherever possible in such a slow process as breeding, and if we can take advantage of work done elsewhere by using sheep already highly developed in some respect, it seems sensible to do so. After all, other countries have been doing this with importations from Britain for many years.

Sheep breeding is basically an exploitation of fertility and is in a very fluid and dynamic state. Today 200 per cent for a lamb crop would scarcely make headline news, but 250 per cent would. In ten years' time this performance may be commonplace. Between now and 1973 much will have to be done to make the world safe for new-born triplets.

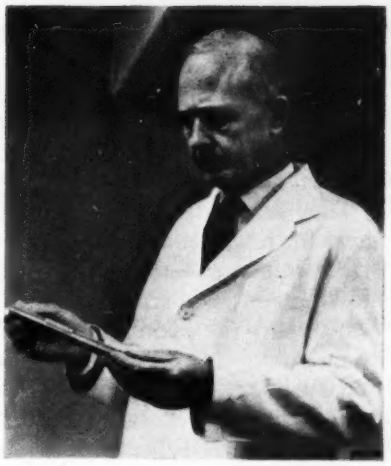
18th Oxford Farming Conference: January 6th–8th

The theme of this year's conference, to be held in the Town Hall, Oxford:

Food Surpluses and Investment in Agriculture

The programme and full details are obtainable from the Hon. Secretary, M. H. R. Soper, University Department of Agriculture, Oxford.

In our November issue Professor Yeates described how the fleshing index of a carcass is derived from its weight and length; and how this, when combined with fat status, may be used as a precise method of ranking carcasses in competitions. In this follow-up article he goes on to show how the fleshing index could also be used as a basis for commercial grading—by measurement, rather than the present method of visual judgment



THE AUTHOR

Beef on the Hook

Commercial Grading

N. T. M. Yeates

EVERYONE concerned with the beef industry should welcome more precise marketing arrangements. Particularly is this so of the ordinary consumer; he resents not being able to buy meat which is accurately identified and available at a price corresponding to its type and quality.

A glance at the market reports for any particular day shows the variation in the selling prices of live butchers' cattle, according to whether they are vealers, yearlings, medium-weight steers, heavy bullocks or cows and also, of course, whether they are in prime, medium or plain trade condition.

Yet these differences are not reflected in the retail meat market; rump steak is rump steak whatever it comes from, and it all sells for much the same price. This is annoying to the public and a source of the unfortunate and unfair sniping against butchers. Lack of knowledge of different price ranges, corresponding to the price of different types of cattle, is a perpetual query in the minds of consumers. Now, when specially choice lines are available, as for example barley beef, accurate official specification seems all the more desirable.

Grading an answer

Fortunately there is a way round this, involving the accurate grading and branding of beef.

Grading should not be just a question of finding what some market likes, then calling the best of that type 'first', the next best 'second' and so on. Rather it is the accurate identification of all the types which go to supply a market, as is done with wool.

Thus vealers, yearlings, steers, bullocks, heifers, cows, all provide carcass meat for retail selling, and each of these classes is made up of animals which when sold are described according to quality by such terms as 'Prime', 'Medium', 'Good trade', and 'Plain'. Both the class (i.e., the age and sex) and quality (i.e., condition) determine the animal's value on the hoof, and so an intelligent consuming public would appreciate seeing this identification carried down to the carcass. The prices of the different types on the hoof would then be reflected in the retail article. In this way customers could buy a reliably labelled product according to their taste and pocket.

Suggested method

The introduction of such a comprehensive scheme of identification calls for grading and branding in accordance with something along the lines of the chart shown here. Under this scheme carcasses of suitable merit would

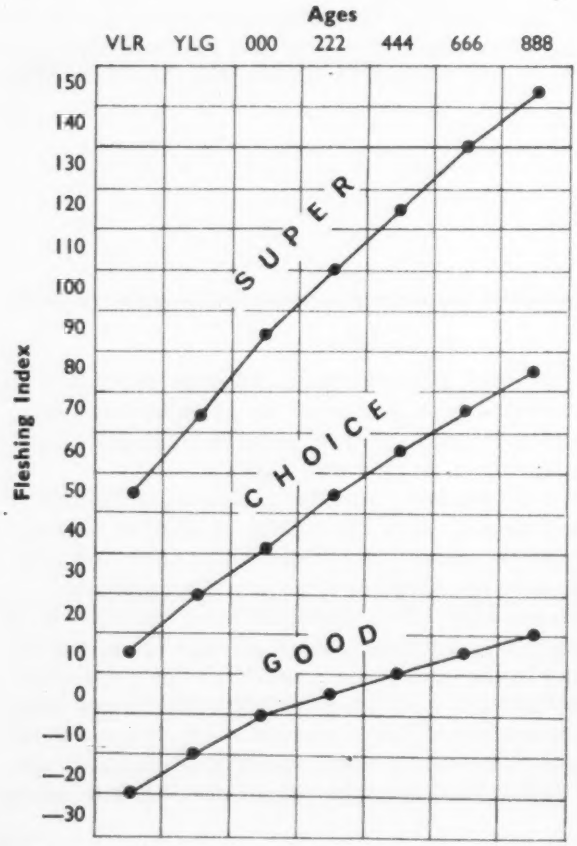


Chart suggested for a new scheme of grading. On the left is the fleshing index, arrived at by taking the length and weight of the carcass and, if necessary, making an allowance for fat. On the top are the ages, expressed in terms of teeth—no teeth, two teeth, four teeth, six teeth, eight teeth, as well as vealers and yearlings

receive one or other of the quality brands 'Super', 'Choice', 'Good', or if below this standard go unbranded. (If identification of lower grades was desired the principle would be extended to include, say, commercial, boner and canner grades, these being determined largely by fat coverage.)

Under this scheme, in addition to receiving a quality brand, carcasses would also be roller branded with their identification of age or type. Thus they would be branded with the additional symbol representing one of the following classes: vealer, yearling, no-tooth, two-tooth, four-tooth, six-tooth, eight-tooth, heifer or cow.

To avoid uncertainty and argument, particularly where the selling of cattle might be on the basis of carcass weight and grade, it is suggested that vealers (branded vlr) should be defined as milk-tooth animals between 200 and 400 lb, yearlings (ylg) as milk-tooth animals 400–500 lb, while milk-tooth steers over 500 lb would receive the brand mark 'O'. (Anything under 200 lb would be regarded as a calf and would not come under this scheme.) It is further suggested that the description 'heifer' (hfr) should be restricted to milk-tooth and two-tooth females whose udders have not secreted, while females over these ages, or with udders which have secreted, should be regarded as cows (branded cow).

Using this approach to grading, the quality rating within each class would be decided by the fleshing index of the carcass. This would be adjusted, if necessary, for any over-fatness, penalizing such carcasses in accordance with the amount of estimated trim; though, of course, a grossly over-fat body would be relegated to a lower classification requiring breaking down and trimming.

Procedure in meatworks

The only new requirement in meatworks routine in obtaining the fleshing index would be the measurement of carcass length. This need only be taken on one side of each body, and it is suggested that it would be done where the carcasses are weighed. Both sides could be weighed together, instead of the current practice of weighing each side separately, and the length measurement (made in seconds with a special measuring stick) substituted for one of the weighings. In this way there should be no hold-up to works procedure.

The ageing of the animals would be a new requirement, and this would have to be done immediately after killing, when the head is being taken off. Following a glance at the teeth, a small waterproof badge indicating whether the animal was a 0, 2, 4, 6 or 8-tooth could be clipped on to the neck in a position not to interfere with removal of the hide, but clearly visible to the grader.

Benefits

A grading and branding scheme such as that outlined would certainly benefit the consumer. For the producer, too, there would be advantages: he would derive just recompense for quality; he would have an incentive to supply a top product; and selling by weight and grade would be opened up for him as a precise new trading method. For the butcher there would be the benefit of having an accurately identified article to sell, thereby placing him beyond criticism or suspicion in such matters as 'dressing up' inferior meat

for sale at the higher prices. Furthermore, the butcher stocking the best meat as regular practice would have his product recognized and could gain advantage from the display of branded joints and cuts.

Are there criticisms?

What criticisms are there of the method? Perhaps the major one is that some folk associated with the industry consider measurement to be impracticable in meatworks procedure. In reply to this, it is granted that eye judgment is quick and easy and that plenty of experts in the trade could grade by eye. But the experts themselves have their own likes and dislikes, as is illustrated by the different opinions found in show judging. Moreover, the experts of the meat industry are generally directors of companies, managers, supervisors, or highly paid specialists of one type or another who could not possibly occupy the role of grader.

If grading is to be universal, hundreds of men will be required for the job; they will not have had previous experience; and they will be in quite a modest wage bracket. It is not conceivable that such staff, using eye assessment, could achieve uniformity of standards; nor is it fair to them, or reasonable to others, that their decisions should be the basis of payment where selling is by weight and grade. Measurement can remove all this difficulty and unpleasantness, and even if it should entail an extra man isn't the industry worthy of that?

It might be said that there are too many grades and types in this scheme and that this would make it too complicated. But wool has hundreds of types and nobody gives this as a reason for not classing the clip. Accuracy demands a reasonably comprehensive analysis, and this scheme endeavours to carry through to the carcass at least the equivalent classifications currently used in livestock selling.

Some butchers might see difficulty in having a quality grade such as 'Super' or 'Choice' covering everything from vealer to cow beef. But the type (e.g., vealer or cow) would be branded on the carcass as well as the quality grade, and each butcher would handle only the type in which he trades.

Trial suggested

Any new and major change needs a period of trial in which problems can be ironed out, while it is equally clear that no new method should be adopted widely without thorough testing. For these reasons I should like to see this scheme, or some reasonably similar version of it, given a year's trial, as an optional trading method, either at some suitable public abattoir or through a producers' co-operative.

Hedges have been a feature of the English countryside for about two hundred years. If their present rate of destruction is not checked it is likely that they will soon cease to be a feature at all

HEDGES

AS A FEATURE OF OUR COUNTRYSIDE

J. M. Way and B. N. K. Davis

In the well-drained and easily cultivated lands of south-east England hedges have existed as far back as Saxon times. The greatest mileage of hedgerow in the country generally, however, was established between the sixteenth and early nineteenth centuries, during the periods of the great enclosures. At the time of the early enclosures the fields were often divided off by hurdles, and in mediaeval times these were certainly used to protect arable crops from cattle. Coarse vegetation and shrubs, particularly hawthorn, would become established along the line of the hurdles, and it is possible that many of the early hedges arose as an accidental growth in this way.

During the enclosures of the eighteenth and nineteenth centuries, however, it has been estimated that some 180,000 miles of hedge were planted as permanent divisions of the land, and it is these hedges in the main that are such a feature of our countryside today. We take them for granted, but to

visitors from more open lands their variety is a constant source of interest, to which is added the illusion of distant forests given by lines of hedgerow trees stretching across the horizon.

At the time of the enclosures the size of the fields was determined by social conditions and by the agricultural practices then prevailing. Both these have now changed so radically that many miles of hedgerow have been uprooted. Others are disappearing through neglect, accidental burning (often a result of the deliberate firing of stubble), high cost of maintenance, and the creeping tide of industrial and housing development, to such an extent that in some parts of the country between one-tenth and one-fifth of the hedges has gone over the last twenty years.

Hedges and wildlife

Surprisingly little is really known about the detailed interaction between the various wild plant and animal life of the hedges and the hedgerows themselves. Yet, the half a million miles of hedge still standing are a major wildlife habitat. It has been shown, for example, that 100 acres of ordinary farm land will support between 100 and 250 pairs of birds of twenty to fifty species, whereas moorland country will support only ten to twenty pairs of birds of three to ten different species. As one of the greatest characteristics of the ordinary lowland farm is its hedgerows, it is probable that these are largely responsible for the greater variety of the bird population found in such areas—especially as the fields themselves will support only such species as partridge, lark and lapwing.

Effect of hedge composition

The value of a hedge as a habitat for game and wildlife depends upon its composition, size and maintenance.

By far the greatest mileage of hedge is composed of hawthorn, with elm, blackthorn, beech and hazel locally common. Mixed in with these basic types are holly, maple, elder and ash, and other species such as the wayfaring tree, dogwood and privet in chalk or limestone districts. Hedgerow trees are of great wildlife and economic value: in the Forestry Commission's 1951 census standard trees of oak, ash, elm, beech and sycamore were estimated to account for one-fifth of the country's resources of standing timber.

Wild herbaceous plants are affected by the composition of a hedge in terms of competition for water, light and nutrients. Thus hedges that contain significant amounts of 'greedy' plants, such as ash and elm, will be the poorer in species of wild plants. Insects are fairly specific in their food requirements, so that a mixed hedge, by providing a greater variety of food, will also support a greater variety of insect species. Invertebrates in general are also very sensitive to their environment, and the greater range of microclimate and microhabitat in a mixed hedge will therefore lead to a greater variety of small creatures dependent on different degrees of shelter, moisture, light and temperature.

An increase in the variety of plants and small animals will lead directly to an increase in the variety of larger animals that live upon them, and so to the carnivorous birds and animals, such as owls, stoats and weasels, at the head of the 'food chain'.

In some parts of the country as much as one-fifth of the hedges has gone in the last twenty years

Effect of hedge treatment

The size and shape of a hedge will also have an effect on the wildlife associated with it. Thus, a high, straggly hedge with an open bottom is usually a poorer habitat than a medium-sized hedge of reasonable width and not too dense, interspersed with taller bushes and trees. Many birds, for example, have a very specific requirement during the breeding season for song posts of a particular height, whilst adequate concealment at a particular height is often necessary for their choice of a nesting site.

The year-to-year maintenance of a hedge, by affecting its composition and size, will affect its value as a wildlife habitat. The traditional method of annual clipping until the hedge bottom has begun to thin out, after which the hedge is allowed to go until it is high enough to cut and lay, has unfortunately become uneconomic on many farms, even where the skill and labour is available.

The chief disadvantage of the modern hedge-cutting machine lies in its inability to deal with the coarse vegetation in and around the hedge bottom, and also in its lack of selectivity so that many young leaders that might eventually become standard trees are cut back to the general level. Where the coarse vegetation at the bottom of the hedge is not brushed out annually, it suppresses other more interesting plants and contributes to the quick death of the hedge bottom itself. Where the hedge bottoms are regularly cleaned out, the soil is disturbed and light is let in, so that annual and biennial plants as well as perennials can become established, so leading to an increase in the animal population.

Hedges and pests

Too few detailed ecological studies have been made of hedgerows, and, although a number of studies have recently been begun by the Nature Conservancy, much remains to be done. The value of hedgerows as one of the largest wildlife habitats remaining in this country is too little realized. It is important that hedges should be appreciated for what they are—regions within the artificial environment of normal farm operations, where wild

plants and animals exist in a highly complex association with one another and normally in balance with man's activities around them.

Occasionally, however, the balance is upset. In some instances the field crop has proved more attractive or abundant than the food plants available in the hedge, and insects or birds normally resident in the hedge have outstripped their predators and become pests. This has happened for instance with a number of aphid species in the neighbourhood of root and horticultural crops, and of bullfinches in fruit-growing districts. Some crop diseases, notably the mildews and rusts, have secondary hosts in hedges, whilst some hedgerow plants find field conditions suitable for their growth and become weeds.

It is noteworthy, however, that few crops are affected by as many as half a dozen pests or diseases, and of these only one or two may also be found in neighbouring hedges. Compared with the hundreds of species of plants and animals to be found in hedges, this is a very small number indeed. The fact that weeds of field crops occur in hedgerows does not necessarily lead to the conclusion that hedges are the source of field infestations. Indeed it is unlikely that, with the exception of nettles, thistles, couch and onion couch, the contribution of seed or plant parts from the hedges to the fields is at all significant, compared with the 'seed bank' of weed species already present in the fields.

There are many reasons why it is becoming increasingly necessary to spray crops against insect pests. One of the less obvious is that the size of our fields and the acreage down to a single crop has become too large for the predator species to maintain a reasonable control. Many of these predator species live in hedges and similar places and range around for their food. If the hedges where they live disappear so will they, no matter how abundant their food supplies.

As a National asset the loss of hedges at the present rate is disastrous, and it is likely that the long-term effect will be to the disadvantage of agriculture in general. This is a serious problem and deserves some serious thought.

J. M. Way, B.Sc., M.Sc., and **B. N. K. Davis, B.Sc., Ph.D.,** are both members of the Nature Conservancy's Toxic Chemical and Wildlife Section at the Monks Wood Experimental Station, Abbots Ripton, Huntingdon. Before joining the Conservancy, Mr. Way worked at the National Vegetable Research Station on problems associated with spray drift of herbicides. Dr. Davis worked at the Nottingham University School of Agriculture at Sutton Bonington on the ecology of soil micro-arthropods in old ironstone workings.

Pat Dodds
of A.M.D.E.C. discusses

Help for New Ideas in Marketing

DURING the past twelve months or so there has been more discussion and action in marketing by the farming community than perhaps at any other period in the history of agriculture. Three factors in particular may have spurred this on—the threat of increasing competition from overseas, uncertainty about the future level of agricultural support and thus the necessity to obtain the maximum price possible from the market, and the dynamic changes that are taking place in the distribution and retailing of food in this country. The third development has meant that the buyers of farmers' produce are becoming larger and fewer in number, and that increasingly large volumes of uniformly graded produce will be demanded by them.

All these factors, however, raise the problem of finding out what the market really wants, and then finding the means of passing this information back to farmers and having the necessary organizational structure to see that it is supplied in the right form and at the right time.

Market Development Scheme

The necessity for stimulating changes in marketing methods was recognized by the Government and the Farmers' Unions when the Market Development Scheme was announced after the 1962 Price Review. The purposes of the Scheme are aiding projects concerned with finding out with more certainty the requirements of the market; promoting grading and standardization, and generally making produce more acceptable in the market; investigating the reasons why produce is defective or substandard when it comes on the market; giving information to producers on aids to

better marketing; assisting in the formation of new local marketing associations; or any other project for the promotion of more efficient marketing.

The Scheme is for an experimental period of three years, during which time projects may be approved up to a total of £1½ million. It is administered for the Government by an Executive Committee of twelve—the Agricultural Market Development Executive Committee—appointed by the three National Farmers' Unions, and is under the chairmanship of the Rt. Hon. Sir Richard Nugent, Bt., M.P. The Committee receives and examines applications and in suitable cases recommends a grant, which can vary between 25 and 75 per cent of the cost. Over the three years the average rate of grant for all projects must be approximately 50 per cent. So, in other words, on average, the industry will match the grants £ for £.

After a quiet start the Scheme has now taken on and a steady flow of applications is being received. About 90 projects have been approved, the value of which, in terms of grant, will before long reach £½ million. However, there is still a large sum available to help any producer or organization which has ideas for more efficient marketing. A few examples will illustrate some of the projects which are being aided.

Testing the market

The largest project being assisted is one put forward by the Fatstock Marketing Corporation, who have entrusted the Agricultural Economics Department of the University of Newcastle upon Tyne to carry out a research programme which will last for five years and may ultimately cost in the region of £150,000. The research programme will cover a study of consumer tastes, of the trade, the combined effect of these two factors on future demand for meat and meat products, and the changes that may be necessary in the production of livestock itself. An expert on market research techniques in the United States will help and advise on the consumer research aspects of the project.

Research projects are not normally quite so big, and in fact, many quite small ones are being aided. For example, the production of Dutch-type veal began about two years ago. It is normally marketed in carcass form and sold in Smithfield. There is evidence to suggest that the housewife is having difficulty in obtaining veal because of the risk to the butcher of buying a whole side or carcass. A group of veal producers believes that it could be marketed in packaged form of suitable sizes to butchers, large retailers and caterers. To find out if this is so, they are testing the market in the Bournemouth/Poole area by sending a man with a van round the various outlets with supplies of veal in this new form. This is a relatively small and simple exercise, but it illustrates the idea of testing out the requirements of the market.

A research project to improve the marketing of Welsh lamb has been put forward by the Welsh Agricultural Organisation Society on behalf of a number of farmer co-operatives. Their ultimate aim is a marketing plan for Welsh lamb based on the New Zealand pattern. Before such a plan can be put into operation it is necessary to devise a classification system based on weight and conformation, then to put it into operation in a test area to see how this classification works in practice and to obtain the reaction of the butcher and housewife. Aid is being given to this preliminary investigation, and if successful, it will be developed more widely next season.

Selling to advantage

In some cases the product is already highly developed and the problem is one of selling to the best advantage. Whilst advertising and sales promotion are not eligible for aid, research designed to find out more about the pattern of consumption can be helped. For example, the consumer panel technique has been used to obtain information on the seasonal and geographical trends in demand for chicken, the type of purchasers, the size of bird in demand, the importance of the various distributive channels. Such information is vital for planning an effective marketing and promotional campaign, especially when production is beginning to outstrip demand. The same technique is being used for turkeys, and for milk and milk products in Northern Ireland. In some products, particularly milk, even more sophisticated research may be necessary to discover the factors affecting the housewife's buying habits. Competing food and beverage firms use these techniques, and where the necessary marketing structure exists, they may need to be used as a tool in promoting the sales of agricultural products.

In the livestock field

But, in many sectors of the industry there is a long way to go before this sort of marketing technique is applicable. It is in these sectors, particularly in the livestock field, that several new ideas and forms of marketing are emerging. These developments are largely concerned with forming a structure through which the supply of relatively large quantities of uniform and improved quality produce can be marketed. For example, one producer group has negotiated with a large wholesale meat company to supply an agreed number of fat lambs on contract over the season, at prices based on the Ministry of Agriculture standard price. The weekly standard price is adjusted upwards or downwards, depending on grade and weight range. The producers in this scheme are assured of a market at a reasonable price before the season starts, and are encouraged to market the type of lamb required. The wholesaler, on the other hand, is assured of a steady supply with some control over quality, and his procurement costs are reduced.

The same group is now working on plans to make similar arrangements for beef and pigs. All these plans are coupled with arrangements to improve and standardize the product.

The success of this type of group, however, may depend in the long run on its success in influencing production methods, so that as far as possible a standardized carcass bearing a relationship to the market demand is produced. A number of projects have been helped with the object of standardizing and improving the quality of produce coming on to the market. For example, in one pork pig group, all members send their pigs to a slaughterhouse where a fieldsman employed by the group grades the pigs, using an ultrasonic testing machine or introscope probe, and the results are passed to each member, with comments. The fieldsman helps members to improve quality with advice on feeding and management and in selecting breeding stock. By working together in this way the group aims at supplying the type of pig meat that the market requires. Groups of this type are a quick and effective way of introducing new methods of production and particularly improved breeding stock.

Uniform marketing

Perhaps the most dramatic integration of production and marketing has resulted from the intensive system of rearing beef. This system lends itself to the marketing of a constant supply of uniform standard animals to buyers, and requires the organized movement of calves from breeders to rearers, and rearers to feeders at an agreed price on contract. A number of schemes along these lines are being grant-aided. Help is given towards the employment of key personnel and even minor equipment such as mobile weigh-bridges, where this is essential to the marketing process. However sound the idea, these new marketing organizations will only be successful in the long run if they are operated on commercial principles and are adequately staffed with the right people.

Starting these schemes, especially where they are pioneering or experimental, requires quite a bit of courage and confidence by producers, and the existence of the Market Development Scheme to help them get started has, without doubt, acted as a stimulus.

The interesting fact that emerges from the new developments is that marketing and production are not separate functions which can be treated in isolation. In the past producer-marketing organizations have concentrated on bringing together produce, and then possibly sorting and grading it before sale. The changing distribution pattern which demands regular supplies of uniform quality in bulk means that marketing organizations must inevitably become more concerned with what is produced, and how it is produced.

Improved marketing necessitates liaison or integration between production and marketing. This may involve for marketing cauliflowers, as an example, control as to acreage, type of seed, time of planting, etc. For marketing eggs, it may necessitate a programme of hatching dates, conditions as to type of bird, feeding programme, and where necessary the setting up of local collecting points and pool prices. This sort of control is not easily accepted. The necessity is becoming understood, however, and in several cases accepted, but this is not universal. Nevertheless, an increasing number of producer groups, farmers' co-operatives and private firms are now working towards this end.

Not a gamble

Whilst there are those who like the gambling element in farming, many of the new ideas in marketing at the present time reflect the desire to operate under a system where both the market and, if possible the price, are known in advance. Secure in such knowledge, the farmer can concentrate his energies on producing what is required at the maximum profit.

Patrick R. Dodds, B.A., is the Executive Officer of AMDEC (Agricultural Market Development Executive Committee). He was on the co-operative development staff of the N.F.U. before becoming Secretary of the Agricultural Central Co-operative Association.

Bulbs are one of the most intensive and expensive crops grown outdoors in this country

What profit is there in BULBS?

John C. Mather

Although daffodil growing is an important feature in the economy of South-West England, the largest acreage of daffodils and tulips grown for dry bulb sales lies chiefly in the counties of Holland (Lincs) and Norfolk, with smaller areas in Kesteven, Lindsey, the Isle of Ely and Suffolk.

All statements made in this article relate solely to these areas

As with most horticultural crops, the profitability of bulb growing is very much tied up with good yields of high quality and a sound knowledge of marketing. Originally, that is from 1900 to the 1930's, bulbs were hand planted in beds consisting of five or six rows 9 or 10 inches apart ploughed by horse. Excellent growth was obtained but the labour costs for planting, lifting and weeding were very high. Herbicides have now simplified the weed problem, but planting and lifting are still a heavy charge on the wages bill.

Tulips, and to a less extent daffodils, are still widely grown in beds, however, and it is likely that more growers will be adopting this system, especially when suitable machinery for planting and lifting has been perfected.

In an effort to reduce costs and speed up operations, planting was tried in ridges and furrows, as for potatoes, either by hand or machine. This did lower costs especially for daffodils, by lifting the bulbs mechanically with a shaker-digger. But more land was needed to grow the same number of bulbs, and other snags such as roguing, lower yields and bruising (and therefore lower quality), refocused attention on to the beds. Ridges are still high in favour for daffodils but they are far from satisfactory for tulips, which bruise so easily.

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Bed and ridge systems compared

The two tables on pages 574 and 575 attempt to show some of the variable costs that arise in bulb growing, though it should be pointed out that there are many deviations from these figures which may, for that reason, incur considerable disagreement. Since bulbs are grown on a wide scale by growers who must essentially be general farmers in order to provide enough land for rotation, the Gross Margin system of costing now adopted agriculturally in the Eastern Region of the N.A.A.S. has been used. In these costings no allowance has been made for Fixed Costs such as depreciation of farm buildings, rent, management, telephone and regular man-hours. On bulb farms men assist women in planting, lifting, roguing and inspection, attending grading machines and put the bulbs through the hot water treatment, but such men will already be employed, whether on bulbs or another crop. Approximately 150 man-hours are needed per acre of tulip beds. On very small family-sized bulb holdings casual male labour would, however, have to be included. Woman-hours have been costed at 3*s.* 7*d.* an hour. No allowance has been made for expensive specialized machinery.

Bed and Ridge Systems for Tulips

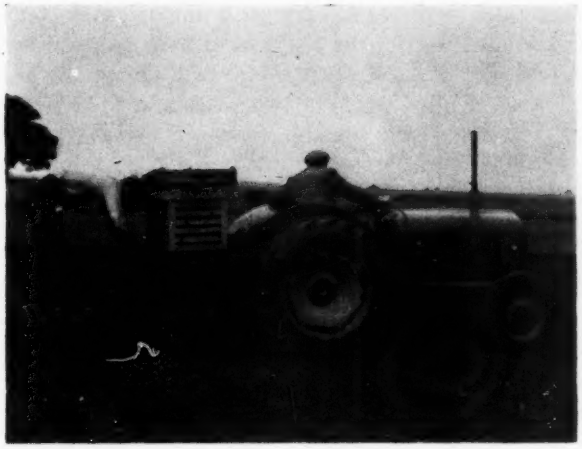
(One-year cycle planting October, lifting following June/July)

Variable costs and purchases per acre	*Beds**	*Ridges†*
	£ s.	£ s.
Fertilizer (5 cwt 10:10:18) and lime (1 ton carbonate of lime)	5 5	5 5
Bags: selling 200,000 bulbs	15 0	
selling 100,000 bulbs		7 10
Sprays: 14 lb Zineb 5 applications	10 0	10 0
4 pints Chlorpropham		
Trays: annual charge	13 10	10 0
Casual Labour:		
Planting: 96 woman-hours	16 0	
36 woman-hours		6 10
Heading	5 0	4 0
Lifting: 200 woman-hours	36 0	
(Plough) 160 woman-hours		29 0
Cleaning	40 0	35 0
Counting, bagging, sealing and labelling 200,000 bulbs	5 0	
100,000 bulbs		2 10
	£145 15	£109 15
Bulbs (value of planting stock at £4 a 1,000, assuming the grower has his own stock)	800 0	600 0
TOTAL	£945 15	£709 15

*Planting 200,000 bulbs in 5 row beds 9 in. apart. Lifting sufficient bulbs to sell 200,000 top sizes and leave enough planting stock for 1 acre

†Planting 150,000 bulbs in 28 in. ridges, flattening bottoms of ridges and hand planting in two staggered rows. Lifting sufficient bulbs to sell 100,000 bulbs and leave enough planting stock for 1 acre

The Gross Returns resulting from sales can be very variable indeed, depending on quality, variety, season, price and grower. A very good grower in a favourable season may sell as many as 200,000 top sized bulbs (i.e., 10/11—12/13 cms) from an acre of beds at an average price of £7 per 1,000.



This machine, developed by the N.I.A.E., can plant anything up to 3 acres of bulbs per day

But prices may vary from £5 to £12. Such a return would give a handsome Gross Margin.

From ridges the grower may have 100,000 top sized bulbs for sale, but it is more likely that the number would be around 60,000 per acre. As the tables show, the difference in actual growing costs between beds and ridges is not as high as might be expected and in view of the superior product and higher yields obtainable from beds, they are to be preferred for this crop.

Bed and Ridge Systems for Daffodils

(Two-year cycle, August/June)

Variable costs and purchases per acre	*Beds**	*Ridges**
	£ s.	£ s.
Fertilizer (10 cwt 10:10:18)	9 10	9 10
Sprays: (4 pt Chlorpropham 2 applications 2 pt Diquat 2 applications)	16 0	16 0
Nets for bagging saleables	8 0	8 0
Hot water treatment @ £5 a ton (Grower's own equipment)	22 10	22 10
Trays: annual charge	30 0	30 0
Casual Labour:		
Planting: 96 woman-hours	16 0	
36 woman-hours		6 10
Lifting: Ploughing-out 120 woman-hours	29 0	
Hoovering-out 36 woman-hours		7 0
Cleaning, weighing and netting 5 tons	8 0	8 0
Cleaning 4½ tons planting stock	5 0	5 0
	£144 0	£112 10
Bulbs (value of planting stock 4½ tons @ £70, assuming the grower has his own stock)	315 0	315 0
TOTAL	£459 0	£427 10

*It is assumed, better to show comparable labour differences, that 4½ tons of bulbs will be planted in both beds and ridges, and that there will be a 10 ton yield after two years with 5 tons sold and ½ ton waste

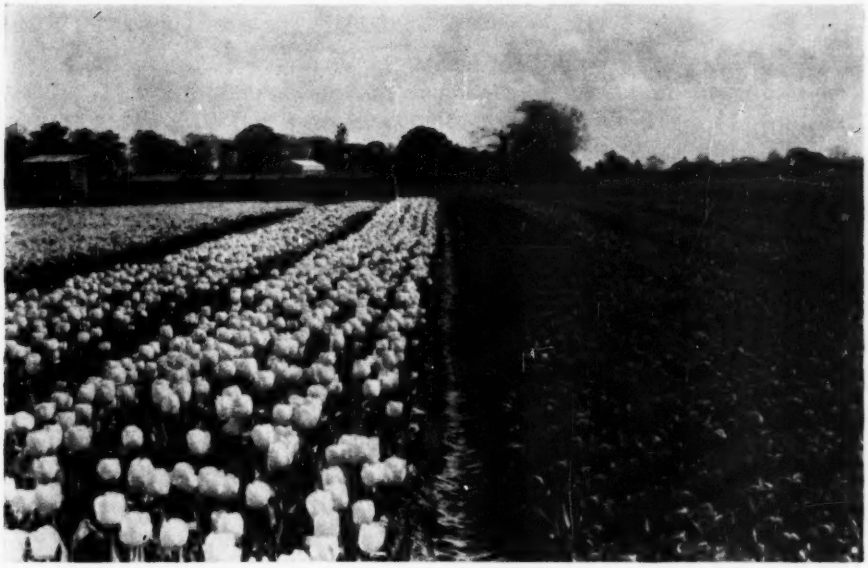
The Gross Returns from sales will again vary with the usual factors mentioned under tulips and whether or not the bulbs have been cropped for flowers. Assuming a 5 ton sale @ £70 a ton, there could be a Gross Margin from beds of £103 an acre when divided over the two years and £119 when grown in ridges. By careful management, saleable yields in excess of this could be obtained and by better salesmanship higher prices, perhaps double, might be realized. With daffodils too, there is the income that can be derived in some seasons from the sale of flowers taken in the second year, which might result in a Gross Margin of £300–400 extra an acre—but not in a season like 1963, when it was nil!

Heavy capital outlay

Earlier on, reference was made to capital in bulb growing. This is needed in large quantities (1) for buying machinery to reduce labour costs and increase output with the same or less labour, and (2) for essential basic cultural operations such as storage of tulip bulbs and the hot water treatment of daffodil bulbs. Capital for the latter can be very high and yet is often idly tied up for many months of the year. The warm air-ducted stores needed for keeping tulip bulbs from time of lifting in late June to planting at the end of October can readily be made by insulating and converting an existing building and installing fans and ducting. A store large enough for 6–10 acres of bulbs will cost around £300. A new building can treble this figure. The cost of a conversion spread over fifteen years and 10 acres of tulips works out at about £3 an acre plus £8 running costs. Where growers also have potatoes, the same building could be used for storage and (with the addition of fluorescent tubes) chitting them, thus spreading cost and depreciation over two crops and extending the period of use from only four months a year to ten.

The cost of a tulip planting machine for beds is about £600 and can only be written off on one crop and used for two or three weeks a year. For up to 5 acres a year such a machine will be as costly as hand planting beds, but six times as fast. At 10 acres the cost would be about half that of hand planting, and for 20 acres or more it is clearly a very worthwhile investment. Growers might combine to share such a machine.

A bulb lifting machine at work. Its rate of lifting is from ½ to 1 acre per day



A field of tulips at Kirton Experimental Husbandry Farm. They were planted by the machine pictured on p. 575 in six rows 8 in. apart

Daffodil growers need to have an efficient hot water treatment bath with sensitive control equipment to combat stem and bulb eelworm and other pests. Capital required here is in the order of £480 for the equipment and another £250–900 according to whether a converted or a new building is used. At the most, such a facility is used for 4–5 weeks, lying idle for the rest of the year, unless some other use, such as treating chrysanthemum stools or mint runners, can be found for it.

A machine that does reduce labour costs and lowers unit costs is of course a grader. Again, it is expensive (about £300 or so) and remains idle for long periods.

To sum up, it may be said that the returns from bulb growing may be very good indeed. But the initial capital cost for stock is high (£1,000 an acre), and substantial capital inputs are needed for equipment and trays. Adequate land is needed for rotation and care at all times is necessary in handling, inspecting, roguing, and control of pests and diseases. In bad seasons there may be few or no tulip bulbs for sale and growers sometimes lift less than they plant. When pests, such as eelworm in tulips and daffodils, and diseases such as Fusarium Basal Rot in daffodils, obtain a serious hold on stocks, things can prove very difficult. Astute marketing goes without saying.

John C. Mather, B.Sc., Dip.Hort.(Wye), is a N.A.A.S. Horticultural Advisory Officer in East Norfolk and is stationed at Norwich. Previously he served in a similar capacity in Bedfordshire, Lincs (Holland), and West Norfolk. He has also worked as an Area Technical Officer for Fisons Pest Control, Ltd., and as an agricultural entomologist at the University of South Wales, Cardiff. He is the author of *Commercial Production of Tulips and Daffodils.*

Research Spot

Some items from the 1962 Report of the
ROTHAMSTED EXPERIMENTAL STATION, HARPENDEN

Potato Blight • Docking Disorder
Nitrogen Fertilizers for Spring Barley

THE problem of controlling potato blight is being approached in a new way by the Insecticides and Fungicides Department at Rothamsted. The idea is that protection against blight might be increased by giving the leaves of potato plants a uniform fungicidal coating that is water-repellent. Besides lessening the likelihood of infection by the fungus such coatings might cling more tenaciously in the rain and persist longer than deposits of ordinary fungicides. Also, as wax films are said to decrease transpiration, they may be of value in checking the loss of water and yield sometimes caused by copper anti-blight sprays.

To select material for field trial, preliminary physical and biological tests were made in the laboratory with foliage from King Edward and Ulster Supreme plants, sprayed with water-based copper fungicides made water-repellent by the addition of silicone compounds, thiols (a form of sulphur compounds used to protect condenser pipes in industrial steam plants) and wax emulsions. Both the silicones and the thiols were expensive and neither proved very efficient at the lower concentrations used, so work was concentrated on the cheaper paraffin wax emulsions.

By adding one per cent of wax, satisfactory water-repellent, clinging films were obtained, and leaf prints from both potato varieties confirmed that the copper was distributed more evenly on the foliage both before and after rain washing. The 'waxed' leaves were also less readily infected by blight spores.

Field trials showed that the performance of copper oxychloride was considerably improved by the addition of wax, but still better blight protection was obtained with an entirely different commercial fungicide—triphenyl tin acetate. The increase in tuber yield obtained by copper-wax spraying was twice that with copper alone but even so was less than half that obtained with the tin compound.

More light on Docking disorder

Some progress is being made towards solving the mystery of Docking disorder. This is the abnormal stunted growth of sugar beet, first observed in crops growing on farms in the neighbourhood of Docking, Norfolk, in 1948. Since then outbreaks have been reported from other parts of East Anglia and farther afield, in Shropshire and Yorkshire.

The first outbreaks studied were associated with peculiar soil factors, but further work at Rothamsted indicates that these are not the only possible cause of the trouble. Among the many outbreaks of Docking disorder reported in sugar beet crops in Norfolk and Suffolk last year, at least three distinct types were recognized and only one of them could be correlated with a particular set of soil conditions.

At several sites, the patches of affected beet were growing on slopes or edges of old marl pits in alkaline soil that proved to contain less organic matter than nearby soils in which beet was growing normally. These cases, which resembled other earlier outbreaks, do seem to be the result of chemical or physical peculiarities of the soil, though the exact nature of these peculiarities has yet to be determined.

At three other sites there was clear evidence that a soil-borne virus—tomato black ring virus—was to blame. These manifestations of the disorder occurred in irregular patches of soil, from which the eelworm known to be a carrier of this virus was recovered. In the affected areas most of the weeds, as well as the beet plants, were found to be virus-infected.

At two other sites, on slightly heavier soils, the stunted beet were growing in kite-shaped 'fairy rings'. Small, central patches of healthy beet were surrounded by large similarly kite-shaped areas in which all the plants were dwarfed and had ill-shapen roots. So far, no disease organism or specific soil condition has been related with this type of Docking disorder.

Spring barley and nitrogen

Some interesting results are reported after three years experiments with different nitrogen fertilizers for spring barley. Urea, calcium nitrate and ammonium sulphate were compared, in terms of grain yields, when broadcast over the seedbed, combine drilled, or placed one inch to the side of the seed. Only ammonium sulphate gave larger yields of barley when combine drilled than when broadcast. Fertilizers containing some of their nitrogen as nitrate are unlikely to give better yields when combine drilled than broadcast, as germination is harmed more by nitrate-N than ammonium-N. No gain was recorded by placing ammonium sulphate close to the seed, but placing urea gave consistently higher yields than combine drilling; the latter damaged the seed. With calcium nitrate, placing was worse than broadcasting, and combine drilling checked early growth.

Sylvia Laverton

Copies of the Report are obtainable from the Station (price 15*s*.).

Cowmen shouldn't spend 15-20 per cent of their time cleaning up behind cows

A. J. QUICK

The SLURRY CHORE

THE slurry problem was born when straw became scarce and building costs began to rise, which often resulted in half the yard being left unbedded and, in many cases, uncovered. This change in yarding practice certainly cut the straw bill, but half the costs so saved was lost in clearing slurry. Disappointingly, in many cases mechanization did not improve matters, for according to a M.M.B. survey of 114 farms the difference between hand and mechanical clearing of slurry from self-feed silage areas was less than one man-minute per day.

It was this sort of information which prompted the N.A.A.S. Milk Group to make a detailed study of the factors affecting the problem. This survey was made during the summer of 1961 and the following winter, covering the methods employed and the times involved in clearing slurry on more than a hundred dairy farms in England and Wales. Summarized, this is what we found:

Method and Average Times for Clearing Slurry (man-min/1,000 sq. ft)

Method of Cleaning	*Interval (in days)*				*Average*		
	1	*2*	*3*	*7*	*Summer*	*Winter*	
Hand tools	8–13	8–16			10	11	10·0
Mechanical	4–18		5–12	4–20	6	8	7·0
Power hose	3–10				4	5	4·5

Clearly, there were factors operating which made it impossible for some men to be as efficient at the job as others. It seems too that hand-cleaning methods were confined to two-day intervals, probably because the build-up of slurry over longer periods would make it difficult to use hand-operated implements. For the same reason power hoses were used daily, particularly where a washed surface was required. But it seems, at least up to intervals of seven days, that the quantity of slurry has little or no effect on cleaning time when a tractor-scraper is used. The difference between summer and winter times appeared to be due to the easier handling of drier slurry.

Cleaning down concrete

Using farm facilities offered by the N.I.R.D. detailed tests were done on various methods of cleaning concrete in collection, feeding and loafing yards. As a measure of cleanliness, it was considered necessary to see that the cleaned area met the requirements of the Milk and Dairies (General) Regulations; therefore the test times are given as once-per-day cleaning. Costs of the various methods were also assessed, using as a guide the average area cleaned by each method recorded on the survey.

Summary of Times and Costs (once-per-day cleaning)

Method of Cleaning	*Average (man-min per 1,000 sq. ft)*		*Average area cleaned (sq. ft)*	*Cost of Cleaning (pence/1,000 sq. ft)*
	Survey	*Test*		
Hand tools	10	8	700	12
Mechanical	7	6	3,000	13
Power hose	4·5	4	1,500	17

Additional Times required to achieve a Washed Surface

Method of Washing	*Average (man-min per 1,000 sq. ft)*		*Gallons used per 1,000 sq. ft*	*% increase in volume of slurry/cow*
	Survey	*Test*		
Mains hose	7·5	9·0	25	12
Buckets of water	5·0	3·0	45	21·5
Power hose	2·5	2·5	170	81·5

It soon became evident that some hand implements were better suited than others to certain types of slurry. The more liquid form was dealt with more easily by using U-shape, V-shape or half-round squeegee scrapers, 30 in. wide and at least 6 in. deep—any of these were equally good. A double-width yard brush was also satisfactory but was of no use on firm slurry. For the latter a shovel-type implement with a thin leading edge was found to be quick and effortless. A double-width shovel reduced cleaning times with hand tools by nearly one-half.

Tests of tractor-scrapers were done on a range of larger yard areas. For areas of 600 sq. ft or less, more than half the time was spent getting the implement to and from the point of work; the job could have been done more quickly by hand. These mechanical implements are better suited to bigger areas.

The most suitable designs for tractor-scrapers were found to be U-shape and H-shape, about 7 ft wide, not less than 12–14 in. deep with 2 ft length of wing. The cost would be about £30 in metal, with hardwood skids.

There is nothing to be gained, other than saving in effort, by using a mains hose in preference to buckets of water and, in fact, if water reservoirs are sited well the concrete surface could be washed nearly as quickly with buckets of water as with a power hose.

Power-hosing

However, if equipment is available for power-hosing it should be capable of removing the slurry as well as washing the surface. Precise tests were done to find the most convenient hose length and diameter (using plug-in couplings at convenient points along a static main), and these were interchanged with various shapes and sizes of nozzle. It was necessary to find the correct combination of pressure, volume and velocity which would allow quick cleaning by floating the muck away, but at the same time not using more water than necessary and reducing splashing to a minimum. The final short list of three best combinations were:

Recommended Pressures and Volumes for Power Hoses

Hose size	*Nozzle size*	*Pump gauge p.s.i.*	*Flow rate (gal/hour)*	*Man-min to clean 1,000 sq. ft.*
36′ × 1½″	1″ round	15	3,600	2·8
36′ × 1½″	1″ round	14	3,000	3·9
36′ × 1½″	1″ round	10	3,000	4·0

A combined power unit (1½ h.p.) and pump capable of producing these performance figures would cost about £45. Plasticized P.V.C., 1½ inches in diameter and capable of withstanding up to 50 p.s.i. costs about 2*s.* per foot. Even at the moderate flow rates and short operational times suggested, the volume of slurry will be increased by nearly 82 per cent (unless the water is recirculated). This merely adds to the problem of disposal, unless, of course, dilution is required.

Too much open concrete

In many cases we found that an otherwise well-designed layout had been spoilt by lack of planning for slurry removal. In fact, the problem was often aggravated by providing excessive areas of open concrete per cow and allowing extraneous water to mix with the slurry. Sizes of collection yards varied from 12 to 40 sq. ft per cow; loafing and feed yards from 20 to 80 sq. ft per cow. There were instances of separate collection, dispersal and loafing areas plus a self-feed forecourt which in total gave three or four times the necessary area per cow. In other cases the cows were paddling inches deep in slurry simply because roof guttering was either non-existent or in need of repair. An inch of rain means ½ gal per sq. ft; 20 inches rainfall during the winter will increase the slurry volume by 30 per cent (assuming only 30 sq. ft/cow of open area). Clean water from roofs and coolers should be diverted to drains, and much of the surface water can be shed by having adequate falls on the open concrete yards.

Is it worth the extra cost of covering open areas? Apart from easier handling and under-cover working conditions, the main advantage will be less slurry to handle which, in turn, means less storage space and cost of disposal. The average cost of 7*s.* 6*d.* per cow per year (30 sq. ft/cow and 15-year depreciation period) for covering the open area cannot be justified if this figure exceeds the additional cost per cow per year, which arises where areas are uncovered. The factors influencing this additional cost will be the amount of winter rainfall, frequency of emptying and the cost of the store. If a simple average is taken for this third factor, then covering the open area will not be economically justified in areas with a winter rainfall of less than 15 inches. To be justified in areas of 20 and 30 inches winter rainfall, the frequency of emptying would have to be restricted to once every 15 weeks and 10 weeks respectively.

Simple layouts

Although littering the whole yard is not an economic proposition, are there not other alternatives which would eliminate the daily cleaning chore entirely? Perforated floors are nothing new but, generally speaking, they have been found wanting in cow comfort and cleanliness. But the principle could be used in loafing and feed yards (and even in cowsheds) in conjunction with cubicles or straw yards. The advantages are that the slurry pit is directly under the cows and the daily cleaning chore is eliminated.

Simplicity of layout is the key to successful slurry removal. Plan rectangular concrete areas, free from obstruction and with tractor access at both ends, so that the slurry can be pushed up a simple ramp or directly into a pit. If the land will take wheeled transport in winter or a particular field is scheduled for ploughing up, double-handling can be avoided by parking a spreader or trailer under the ramp or in the pit for direct slurry disposal on the land. Cowshed floors between heel-steps should slope towards a central channel, and the double doors should slide back beyond the heel-step.

Cows produce about $1\frac{1}{2}$ cu. ft (90 lb or 9 gal) of dung and urine per day. This figure is used to estimate the size of slurry pits, tanks or compounds. Any necessary allowance for rainfall and washing water must be made. In straw yards about one-third of the total will be absorbed by the bedded area, but with cubicles the total production must be removed daily. Every effort should be made to make use of split-levels for high-level filling and low-level emptying, but if this is not possible artificial levels can be created with ramps.

A. J. Quick, N.D.D., is the Deputy Regional Milk Production Officer and Work Study Adviser for the S.W. Region of the N.A.A.S. He has been awarded a Kellogg Fellowship to visit the U.S.A. in 1964 for the study of cow management, housing and milking.

Good conditions reduce litter losses

These four-day-old Landrace piglets, warm and snug under an infra-red lamp, were part of a litter of nine, all of which were reared successfully

Warmth and Safety for Piglets

Nigel Harvey

ONE piglet in every five born in this country dies before it can be weaned. Many die from genetical defects or from disease. But many others die 'for reasons related to management'. Among these reasons is the wrong kind of environment. What, then is the right kind of environment for the sow and her litter?

Like many an apparently simple question, this is really a combination of a number of not-so-simple questions. But fortunately research workers have in recent years provided a lot of useful information and advice on the problems involved and on methods of meeting them. These findings do not, of course, satisfy all the farmer's needs, but they give him the means of meeting quite a number of them.

Piglets need warmth

First of all, consider the characteristics of the piglet, which has been described as 'the most immature of all farm animals at birth'. We all know that it has little natural protection against cold and draughts. But not all of us realize that it is further handicapped during the first few days of its life by a peculiarly under-developed internal heating system. Research has shown

that its body temperature falls markedly at birth and that the degree to which it falls and the rate at which it returns to normal depend largely on the air temperature. So the piglet needs warmth. Above all, it needs warmth when it is very small.

How much warmth? Most authorities take 70°F as a minimum and many prefer a higher temperature, up to 80°F, at birth. So 75–80°F for the first three days and then 70°F seem reasonable figures.

But, of course, piglets have often done well in houses where the temperature seemed far below these figures. Doesn't this suggest that the authorities are wrong? No, it suggests that the houses were right, more right than the thermometers indicated. For though the general temperatures in these houses were below the optimum, there is little doubt that the particular temperatures of the areas where the piglets lay were a good deal higher. In the words of one investigator, 'the huddling of the piglets, the proximity of the sow, loose straw, raised wooden floors and pig creeps, all tend to make average house temperatures poor estimates of the real climatic environment of the piglets'.

Thermometers at floor level

So remember to put thermometers at floor level, where the piglets live. They will not be so easy to read as thermometers at eye level, but they will pay better.

Remember, too, to look at the thermometer regularly, for piglets need an even temperature and are particularly susceptible to draughts and other changes in temperature. They also need a dry bed, as a number of trials have shown. In one case, for instance, the provision of a dry, insulated floor made it possible to rear good pigs in a building where previously it had been impossible. The importance of these two factors has been emphasized in recent experiments which showed that piglets can adapt themselves to temperatures as low as 38°F, provided they are protected from draughts and damp.

Problem of the sow

So much for the piglet. The requirements of the sow, with which the piglets are usually reared, are less exacting. But unfortunately they conflict with those of her litter. Firstly, she is sensitive to heat and appears to be most comfortable at temperatures between 50° and 60°F. Secondly, her size and clumsiness make her a permanent and mobile source of danger to her litter. Indeed, one of the major causes of piglet loss is crushing by the sow, particularly in the first few days after birth.

In practice, of course, the different needs of the sow and her piglets are neatly met by the provision in one building of two temperatures, a moderate general temperature and higher local temperatures at certain points where artificial heating warms nests or creeps in which the piglets are safe from crushing. The general, 'background' temperature should neither cause the sow discomfort because it is too high nor endanger the piglets because it is too low—the colder the piglet, the greater the likelihood of its seeking the warmth of its mother and so running into danger. A temperature of 60–65°F seems to meet both needs satisfactorily, while the additional 15 degrees or so in the nests or creeps is an effective inducement for the piglets to enter their safety zones.

Protecting the piglets

The findings of investigations into the comparative efficiency of the many ways of providing such safety zones are necessarily more limited in application, since the variations in detailed design and equipment are so great. But it seems fairly clear that the familiar farrowing rails are less effective in reducing losses than either the crate-system or the central-ring system, sometimes called the Ruakura system after the New Zealand research station where it originated. Experiments comparing the two latter methods were, however, less conclusive, though they suggest that the central-ring technique is well worth consideration by pig farmers. In three out of four sets of trials in this country it gave better results than conventional systems.

Good accommodation pays

All this, of course, is inevitably rather general. But there is some highly specific evidence available on the effects of providing piglets with the right accommodation. Thus one survey showed that piglet losses in good accommodation ran steadily at 7–10 per cent throughout the year, whereas in poor accommodation they rose as high as 50 per cent in the late winter months. Similarly, in certain farm trials the average number of piglets weaned per litter was 0·58 more in heated than in unheated pens, and their average weight at weaning was 2·41 lb greater.

Significantly, it was also noted that piglets continued to go to a dull-emitter infra-red lamp even after the light which had originally attracted them was switched off. They knew what was good for them. And what is good for piglets is surely good for the farmer.

Mr. Nigel Harvey, M.A., Q.A.L.A.S., a frequent contributor to *Agriculture*, is a member of the Agricultural Research Council's Farm Buildings Unit.

New Ministry Booklets

THE FARM AS A BUSINESS

No. 2. Aids to Management—Beef. 2*s*. 6*d*. (by post 2*s*. 11*d*.)
No. 3. Aids to Management—Sheep. 1*s*. 6*d*. (by post 1*s*. 9*d*.)
No. 5. Aids to Management—Poultry 1*s*. 6*d*. (by post 1*s*. 9*d*.)

FARM SAFETY (Free)

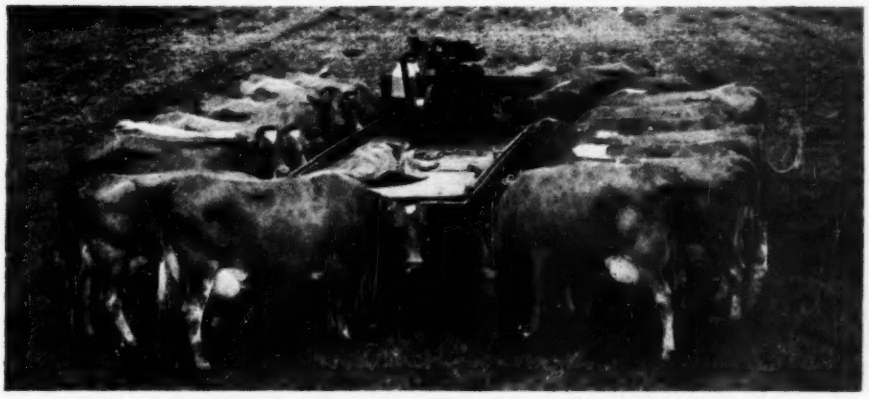
Eric G. Baker

Guernsey Milk

GUERNSEY is the second largest of the Channel Islands; 25 sq. miles, supporting some 45,000 people. Although domestic affairs are completely self-governed, Guernsey enjoys the important privilege of free trading rights with Britain. This has built up a strong commercial link between the two countries and has been largely responsible for the Island's rapid economic recovery since the end of the German Occupation.

Today, Guernsey owes much of its prosperity to a successful horticultural industry, but the growth of tourism and the influx of capital supplied by well-to-do residents are bringing a wave of prosperity.

This expansion of local industries and the need for housing a growing population is naturally making large inroads on farm land. At present, less than 5,000 acres are available for agriculture, as distinct from horticulture.



Guernseys waiting to be machine milked in the field. The animals are tied to a four-wheeled cart fitted with power unit and vacuum pipe

By tradition, the main source of Guernsey's farm income is dairying, and virtually all farm land is now devoted to it, supplying an expanding local market for milk and cream. This is sensible, since the importation of fresh milk to this fairly remote island, but one of tremendous popularity with holiday-makers, would create many difficulties. Dependable supplies of most other farm products can readily be bought in the British market at prices well below what their local cost of production would be.

Restricted grazing

There are now 250 dairy farmers on the Island, each keeping on average 11 cows and a few followers. The farms average only 18 acres and are usually split into many small scattered fields. Practically all lack adequate fences which, together with the scarcity of land, accounts for the traditional practice of tethering cattle. Even today, grazing is mainly restricted in this way, although a few of the larger farmers have now turned to electric fences.

This close control of grazing has helped to develop a quite intensive form of grassland management so that, despite an average stocking rate of one cow-equivalent to every 1¼ acres, an average yield for each cow on the Island of over 700 gallons is being maintained by feeding just over 2 lb concentrates per gallon.

Because the holdings are so fragmented nearly all cows are milked in the fields during the summer. Many of the smaller herds are milked by hand, but machines are beginning to be seen more and more. The latter are used in conjunction with various forms of home-made bail, the conventional milking bail being too large to move along the very narrow lanes. This system of outside milking is successful because the Island cattle are very docile. Also the milk is collected immediately after each milking, so that cooling on the farm is not necessary.

Changing emphasis of support

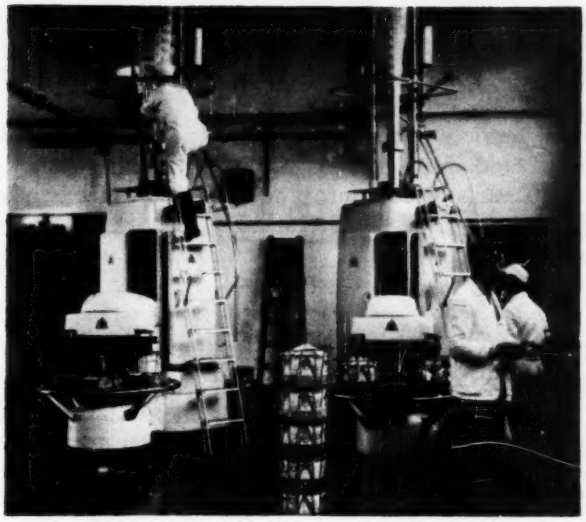
For many years now the Guernsey Government has found it necessary to encourage milk production by providing the industry with a fairly high level of support. Until recently this has mainly taken the form of a guaranteed price based on a margin over the estimated cost of production. This guarantee, now giving the producer 5*s*. a gallon on all his sales, is maintained by Exchequer grants and a retail price slightly above that in Britain for similar quality milk. But it is also the result of the industry's low distribution costs and its ability to sell most of its milk on the liquid market.

Whilst this favourable price structure has certainly enabled milk production to keep pace with a rising demand, it has provided no real incentive towards reforming the primitive farm structure. The cost of production, therefore, remains very high and it follows that despite their substantial guarantees, most producers have not been enjoying a full share of the Island's present prosperity. However, this situation is now being recognized, and recently a very forward-looking agricultural policy has been promulgated. This aims at providing greater incentive to increasing the industry's efficiency and, as a first step, the cost plus system of determining the guaranteed milk price has been abandoned in order to pave the way to a more competitive support structure. This will now lay greater emphasis on farm improvement and production grants, rather than increasing the direct price incentives.

Terrific demand for summer milk

A problem which Guernsey shares with other remote island resorts is the marked increased demand for milk during the summer, the peak period coinciding with the very time when grassland is least productive. In Guernsey the situation is made more difficult because the light, free-draining soils and low summer rainfall can often lead to real drought conditions. Only a small surplus of milk is normally carried during the year.

So far, a differential price system which provides a high premium for summer milk has encouraged farmers to calve down their animals at the right time. But, as the seasonal demand continues to grow, the problem now is to provide sufficient summer fodder. An attempt to do this is being made by giving grants for growing suitable forage crops. An interesting aspect of these grants, which incidentally reflects the new support policy, is that they will be financed by a levy on the producer's milk price rather than from the Exchequer.



Two Tetra Pak machines in use at the Island Dairy. Each can produce 3,600 pink paks of milk per hour. The tetrahedral shape of these containers allows 18 pints to be packed automatically into each hexagonal-shaped crate

Cattle breeding plans

Guernsey farmers are justifiably proud of their local breed of cattle whose popularity has spread to many parts of the world. Until recently, the export of surplus stock was a useful addition to farm incomes, but most breeders are now finding it more profitable to keep extra milking cows. So less than half of the heifer calves now being born are retained. This does not mean, however, that there has been any set-back in breed improvement. In actual fact, prospects are better now than ever. This is largely the result of an Artificial Insemination Scheme introduced into the Island by the Government eight years ago. The scheme, run by a Committee of local breeders, has steadily gained in popularity, and 80 per cent of the cattle population is now artificially inseminated.

Once A.I. was firmly established, it was with considerable foresight that an island-wide herd recording scheme was launched. This provides a free service to farmers and, as an added incentive, a bonus is paid on all milk sold from recorded herds. It is not surprising therefore that nearly all farmers are members of this scheme, which records solids-not-fat as well as butterfat.

But although adequate performance data is now available, it is not easy to obtain an accurate comparison of the progeny of A.I. bulls. There is so much variation in management among the Island herds; also, herds are so small that the contemporary comparison method used in Britain is not practicable. Nevertheless, these difficulties have now been partly overcome by placing all herds in one of five 'Management' groups based on their average lactation yields. In this way five large 'herds' have been created within which sufficiently large progeny groups can be compared under similar management conditions. I believe that this modified contemporary comparison method is proving successful and that it will be accepted by other countries. This could be an important point if ever cattle exports became significant again.

Since cattle have never been imported for many generations, Guernsey must have the smallest closed animal population to be almost entirely serviced by A.I. This brings with it special problems. For example, very few bulls are now being bred privately and the A.I. centre is having to help maintain

its stud by arranging matings of its proven bulls with suitable cows. Fortunately, breeders are co-operating enthusiastically with this contract mating plan which will eventually form the corner-stone of the Island's breed improvement programme.

As the number of natural services continues to decrease, the A.I. centre is having to take over more and more responsibility for breeding policy. This is, in effect, putting the Island's breed improvement plans into the hands of one authority which, by willingly accepting technical advice, should make possible some encouraging progress.

Milk in packs

Several years ago the Government took over responsibility for the marketing of milk, and the Island now has a well-equipped central dairy which collects all the producers' milk and, after pasteurization, puts it into Tetra Paks for retailing. These Swedish designed containers have been in use for six years and are a considerable improvement on the previous method of selling direct from the churn.

The actual delivery of milk and cream is in the hands of some 52 private operators who work in a district and on a price margin fixed by the Dairy. In this way, the roundsmen have a sales incentive, whilst the Dairy still keeps control over marketing. The surplus milk—a mere 15 per cent of the Dairy's total annual intake—is made into butter, for which there is a small but firm demand and now retails at 5*s.* 6*d.* a pound.

Looking to the future

Guernsey's prosperity seems likely to continue and with it the demand for fresh milk and cream. It also seems that the comprehensive programme of support and services to the dairy industry will be maintained. So this should encourage the production of sufficient milk for some years to come despite a decreasing area of farm land.

But although market prospects appear satisfactory, the industry's prosperity and perhaps even its future will largely depend on an ability to improve its competitive position. Much has of course already been done in recent years to shape the industry to meet the needs of the community, but many changes to farm size and layout will be necessary if present-day machinery and labour resources are to be used effectively.

As transport facilities improve, the possibility of local producers having to share their market with imported milk in one form or another cannot be overlooked. At present, very little competition of this nature exists, but this may not always be so if local production costs continue to rise in relation to those in other countries.

Fortunately, this problem of increasing productivity is now being tackled seriously and, although any spectacular change is unlikely, there is reason to believe that over the years we shall see a gradual improvement.

Eric G. Baker, B.Sc., M.S. (Iowa), was seconded from the N.A.A.S. in 1961 to act as Agricultural Adviser to the States of Guernsey, and is assisting in a reorganization of the Island's farming policy. While in the U.S.A. on a Kellogg Foundation scholarship, he had specialist training in animal breeding, and he is using the knowledge so gained to help develop a cattle improvement programme for Guernsey. Before his secondment he was a District Advisory Officer in N.W. Derbyshire for three years and was especially interested in improving the management of small dairy farms.

11. East Penrith, Cumberland

D. G. MacDougall

THE East Penrith district lies within a triangle, the three corners of which, to all intents and purposes, are Penrith, Carlisle and Alston. Whereas the district can be divided from south to north so far as the types of farming are concerned, climatically and geographically it changes from west to east. The rainfall in the near western part may be as low as 30 inches, whereas in the far eastern part it can rise to 47 inches. The altitude varies in the same way. The north-western tip of the district is very near sea level, and yet the south-eastern part rises to over 2,900 feet.

Geologically, the Northern Pennines split the district. On the east side the Pennines fall away slowly to the coalfields of Northumberland and Durham, and here there is an area of carboniferous limestone. On the west side they rise abruptly from the low-lying Vale of Eden by a step-like series of scarps. From Penrith to the north runs the new red sandstone of the Vale of Eden with the St. Bees sandstone or shales between it and the Pennines.

Agriculturally, the district lies in such a way that it can be divided on a north-south basis into three areas, conditions being very similar both at the north and south ends of each area. Such items as calf-rearing schemes, pig-weaner schemes, etc., are general for the whole district, but otherwise there is a very wide range of agricultural conditions.

The western area lies mainly on the red sandstone, and is bounded on the west by the main line railway and on the east by the River Eden. From the A6 road, which runs up the centre of the area, an excellent idea of the type of farming can be obtained. This is good, sound fertile land, possibly on the light side, but capable of high production. The main enterprise is dairying, and it may be on a fairly large scale where all the modern techniques such as self-feed, cubicles, yards-and-parlours are used. High-quality dairy herd replacements are reared and the surplus sold in many cases. Grassland management is good and intensive. Oats, wheat and barley are grown, all giving reasonable yields, but barley is the most popular cereal and modern techniques for handling and storing the grain are applied. Apart from potatoes, most root crops, i.e., kale, swedes and mangolds, are grown for home consumption; lamb-fattening on excellent root crops is quite common in the area. Beef cattle can vary from intensive, barley-fed Friesian steers

to grass-fattened forward stores of all types. Half-bred or Greyfaced ewes are the most popular for breeding, and they are crossed with Suffolk or similar rams. There are also some large pig and poultry enterprises.

In the central area, lying east of the Eden and bounded by the Pennines on the east, farming systems are very similar to those in the west, but they are affected by changes in the type of soil, which becomes slightly heavier and shows the presence of boulder clay towards the eastern boundaries. Milk is still an important enterprise, but for the most part the herds are not so large. More young stock are kept, and the sheep show the influence of the popularity of the Bluefaced Leicester rams. It is, to some extent, from the eastern part of this area that the breeding and fattening lambs find their way to Lazonby market. It is not unusual to see exceptionally good crops of roots almost at the fell bottom and to find fairly intensive stocking of grassland. For the most part the farming is rather more mixed and cropping yields are slightly lower, especially for corn. Most of the area stands above the 400 foot mark and specialization in seed potato growing is quite an important enterprise.

The eastern area gives us a complete change of farming. Alston is the only centre and, although situated at almost the lowest point, it is still some 1,400 feet up. The hill land surrounding Alston and the end of the Pennine Chain is the home of the Swaledale ewe and the Galloway cow. This area contains a relatively high proportion of small dairy herds (a legacy from the war days), but much of the income comes from the sale of cross lambs, which are a result of the cross between the Swaledale ewe and Border-Leicester or Bluefaced-Leicester rams. It is for these lambs that the southern buyers come to Lazonby market, for Alston Moor lambs are famed for their healthiness and their ability to do well on lower ground.

Many of the farms in the Alston area are relics of the days when lead mining was an important industry in the district. Because of this, their acreage is relatively small for hill farms. This has resulted in a considerable economic problem, and while the larger farms tend to hinge themselves to their sheep and store cattle from suckler herds, the smaller farms have had to resort in some cases to dairying and in others to enterprises such as poultry and pigs. Extremely severe winters and short summers make the production of winter feed very costly. With a rainfall of approximately 47 inches and a peaty soil on clay, excessive moisture is a continual problem.

Although not associated with the Lake District, many of the rural sports found there are also practised in the eastern part of Cumberland, such as hound trails, sheep-dog trials, wrestling and fox hunting. Because of the relative lack of industry within the area, most of the population have a distinctly rural outlook. They are nearly all connected in some way or other with farming, and this accounts for the intensive interest in all matters connected with agriculture. With Carlisle and Penrith at each end, the district is very well supplied with markets, and there is a certain amount of local industry, mainly connected with agriculture, at these centres. In addition, coal and gypsum mining are still to be found within the district.

Agricultural Chemicals Approval Scheme

Additions to the 1963 List

The following additional products have been approved under the Agricultural Chemicals Approval Scheme. The Third List of Approved Products was published on 1st February, 1963.

INSECTICIDES

BHC

BHC Smokes

Fumite Lindane Smoke Generators (sizes 10 and 40)—Waeco

FUNGICIDES

THIRAM

Wettable Powder Formulations

Midox T.M.T.D.—Midox Agricultural Division of Rentokil Laboratories Ltd.

ZINEB

Wettable Powder Formulations

Midox 80% Zineb—Midox Agricultural Division of Rentokil Laboratories Ltd.

HERBICIDES

CHLOROXURON

For soil application to control germinating weeds in newly-planted and established strawberries.

Wettable Powder Formulations

Tenoran—CIBA Laboratories Ltd., Horsham, Sussex

DICHLORPROP

Potassium Salt Formulations

Blitzshank—Vigzol Oil Co. Ltd.

Fernoxone P—Plant Protection Ltd.

SEED DRESSINGS

Gamma—BHC (LINDANE) SEED DRESSINGS

Dry Dressings

Abol Gamma Seed Dressing S (for sugar beet)—Plant Protection Ltd.

Liquid Dressings

Mist-O-Matic Wireworm—Murphy Chemical Co. Ltd.

H. G. PENFOLD
Agricultural Land Service, Leeds

Push-bucket Feeding

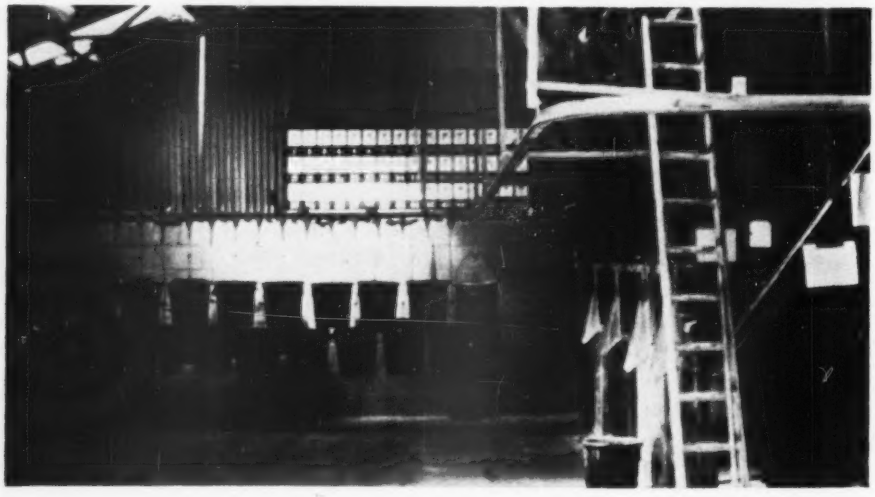
How to feed, with maximum labour efficiency, 2 lb of meal per pig twice daily to four hundred fattening pigs, was the main problem facing Mr. J. R. Williams at Ottringham Grange, near Hull.

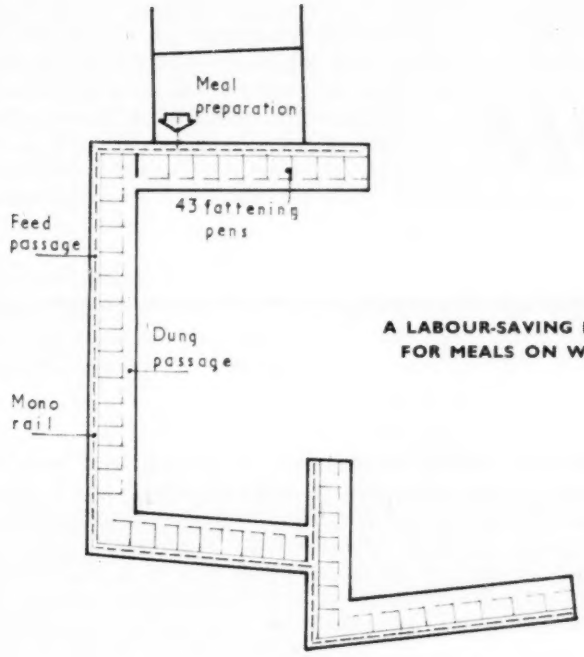
A problem indeed it was, for his fattening pens were ranged around four sides of existing fold-yards in narrow, converted, single-storey buildings. This layout was not from choice but was dictated by the fact that, as a tenant, he had to make full use of existing, structurally sound buildings.

After much thought, traditional Danish-type pens, forty-three in all, were built, eight feet wide including troughs, with 3 ft 6 in. wide feeding and dunging passages. All are insulated at pen wall height with removable polystyrene sheets, the pen front being sealed to prevent draughts. Hopper windows in the feed passage and the unfelted pantile roof provide inlet and outlet ventilation. Two main outlets in the dung passages connect to an underground liquid manure tank. Slurry formed by running water into the dung passages is swept into these two outlets by the pigman.

The installation of a mono-rail, continuous from an adjoining meal preparation area and serving all pens, has given maximum efficiency in

Meal preparation area, showing filled buckets on mono-rail and ration indication board





A LABOUR-SAVING LAYOUT FOR MEALS ON WHEELS

feeding. From this rail, mounted over the feeding passage, hooks on wheel runners support black industrial polythene buckets which can hold thirty-five pounds of consolidated meal. Rations are weighed from meal bins into the numbered buckets in accordance with predetermined quantities for each pen, which are displayed on a ration board. This has an individual pen dial graduated up to forty pounds, the ration being indicated by a red centre sweep arm. After each bucket is filled, it is hooked on to the mono-rail in a pre-arranged position. The actual feeding operation consists in pushing the filled buckets along the rail, emptying the meal into the troughs, and returning the bucket to its hook. An individual variable-capacity water cistern over each pen connects to a drilled discharge pipe over the troughs.

An examination of the daily work routine is revealing. The total time per pig is considerably less than comparable accepted standards for good farmers, as this table indicates;

	Time (min per pig)	
	Good	*Ottringham Grange*
Feed	6·5	1·59
Clean	4·8	0·78
Other work	3·3	0·67
Total	14·6	3·04

These exceptional timings are to some extent due to the keenness and energy of the young pigman. They do not, however, detract from the conclusion that labour efficiency can be achieved in other than fully mechanized modern piggeries. Thoughtful planning, good management, buckets and a mono-rail need not be the prerogative only of Mr. Williams at Ottringham Grange.

IN BRIEF

Trees on the Move

The techniques of restoring opencast mining sites to farming land have been greatly improved during the past ten years; the series of articles by W. Morley Davies in recent issues of *Agriculture* has shown this. Now the National Coal Board, following American research, is proposing in the name of amenity to go a step further by transplanting anything from hedges to mature trees up to 60 ft high and with trunks of 16 in. diameter. Special machines have been designed which consist of a rubber-tyred tractor fitted with a hydraulically-operated shovel blade, the angle of which can be varied at will.

First the machine digs out, in the area to which the tree is to be moved, a cone-shaped hole slightly larger than the root-ball of the tree to be transplanted. For larger trees this will be about 6 ft deep. The machine then digs out the tree to be moved, which is then lifted and taken to its new position. If the tree has to be transported some distance, involving a road journey, a special trailer is used.

Even the more tender, fibrous roots are removed undamaged by this equipment. Replanting must of course be done as quickly as possible to make sure that the roots do not suffer by exposure.

When the tree is in its new position a small mechanical shovel is used to pack excavated soil around the edges of the root-ball. This is then carefully watered in to prevent the formation of air pockets and to hasten the settling of the soil.

Bacon Supplies

Agreement has been reached with overseas producers about the supply of bacon to the U.K. market. The aim is to achieve market stability coupled with growth. The wide and sudden price swings experienced in the last few years, with an overall trend downwards, is no good either to the producer (at home or overseas) or to the consumer. A dead level price throughout the year cannot, of course, be expected, but the agreement should have the effect of cutting out the more violent fluctuations.

The understanding provides for setting a minimum annual quantity of bacon for the U.K. market from home production and imports together. There is also provision for a reserve quantity to give the necessary flexibility to supply.

The U.K. Government will decide the quantity required on the market at any time. For the first year, which will run from 1st April, 1964, the minimum quantity should be 615,000 tons—somewhat more than this year's total supply. The market has been a bit short at times this year, and it is also necessary to allow for natural growth. Should this quantity prove insufficient, a reserve of 25,000 tons will be there to draw on. The phasing of these supplies to the market in a steady flow will be arranged by a Bacon Marketing Council, consisting of representatives of trading advisers from countries concerned under the chairmanship of the U.K.

Safety with Kale

Arising from Mr. F. G. Clegg's warning about the feeding of kale (October *Agriculture*), we have been asked by a reader to say what the safe limits are. It will be helpful if we first say that kale can replace other foods as follows:

10 lb kale = 3 lb average hay
= 14 lb roots
= 5 lb potatoes
= 1¼ lb crushed oats

Dairy Cows under controlled grazing will eat 60 lb in 1½-2 hours; and this, with 7 lb of average hay, would make up the maintenance ration of a 10-11 cwt cow. Then cereals alone can be fed for the production of the first 2 gallons. Cows fed 14 lb of hay per day and allowed to graze freely between morning and evening milkings will eat up to 80 lb per head—sufficient for maintenance and 1½ gallons; 6 lb of cereals can be fed for the next 1½ gallons.

Beef Cattle will take 60 lb of kale per head per day which, with unlimited access to straw or hay and 6 lb crushed cereals, should give a return of 2-2½ lb daily liveweight gain.

Ewes on late-autumn grazing will maintain themselves on 120-140 lb of kale per head per week. Cereals should be fed six weeks before lambing, starting at ½ lb per ewe daily, increasing to 1½ lb. A suckling ewe will eat about 140 lb of kale weekly, given *ad lib.* hay and 1 lb of cereals each day.

Tegs folded on kale from October will eat 70-90 lb of kale per head per week, but give also 1 lb of cereals daily.

The hazards of heavy feeding of kale, to which Mr. Clegg referred, can be reduced by supplementing the cereal allowance with 2 per cent of a high phosphorus, high iodine mineral mixture, as sold by several reputable firms.

Quote

'Is there a danger that we may overdo our fertilizer dressings of grassland? We know that too much nitrogen can throw corn crops down and in some cases may favour disease, though in others it may swamp the effects of disease, as with take-all. The main risk from over-generosity is not that crop yield may actually suffer, but that it is wasteful—expenditure for no added return.'

'It is rash to be dogmatic about this, because fertility can be stored in the soil. We may not be very clever about the chemistry of the matter, but experiments at Rothamsted and elsewhere, and very much practical experience, have shown that P and K accumulated in the land do produce very useful results years later. Nitrogen may not persist in available form, but by producing greater organic residues it can make useful contribution years after application.'

Sir Harold Sanders
Chief Scientific Adviser,
Ministry of Agriculture, Fisheries and Food

The Dairy Cow. C. CRAPLET. Edward Arnold. £6 10*s*.

An authoritative book on milk production, including an integration of recent research in the field of genetics, physiology and nutrition, would be of great value to teachers, advisers, students and farmers in the United Kingdom. The need is perhaps emphasized by the fact that most successful efforts to produce a volume of this sort in the last two or three decades have been made in the United States, where the agricultural background is often very different from that on this side of the Atlantic.

Considerable interest will therefore be shown in Dr. Craplet's book, particularly since he is able to write both from the veterinary and animal husbandry points of view.

The book has a wide scope, being in six parts: Reproduction and Lactation; Artificial Insemination; Genetics and Methods of Reproduction; Nutrition; Housing, and Diseases. It is well illustrated and is obviously written by one with a wide experience of the subject. At the same time it is evident that no single person can have a specialist knowledge of the whole field of milk production, and in some sections the author has fallen back on generalizations which are not always acceptable to those who require more precise information.

Two types of technical shortcomings are particularly evident. The first includes statements which are patently not true or no longer true; for example, that the use of the single-action milking machine is widespread in the U.S.A., that 60 per cent of the cows in England are milked by machine, that there are two systems of fencing—barbed wire and electric. The second type of technical defect, particularly from the point of view of teaching students, is that in which a bald statement is made which, on average, may be correct, but which is useless or even misleading unless qualified. Instances are the statements that thrice-daily milking increases milk quantity by 10 per cent over twice-daily milking, and that in traditional grazing, whatever the season, a dairy cow must be fed a mineral supplement rich in phosphorus. Unfortunately, many other cases of this sort could be quoted, and they make the book a dangerous tool for students, who are usually inclined to accept without question information in a text-book of this sort.

Apart from technical defects, the style of presentation cannot be left without comment. Owing to the size of the subject the author has been forced into considerable summarization but this need not be accompanied by a confusing subdivision and subheading of chapters. The work of a large number of research workers is referred to, and a bibliography would be of great value to the student. In some tables the units used are not stated.

One is impressed by the amount of technical information on the dairy cow which has been assembled by Dr. Craplet. The stream—one might almost say torrent—of information conveys the enthusiasm of the author for his subject. However, bearing in mind that a substantial proportion of the material is inevitably coloured by the French agricultural and economic background and consequently is not directly applicable in Britain, one questions the wisdom of a costly English translation, at least until the imprecisions have been removed and the form of presentation improved.

A.S.F.

Pig Housing. DAVID SAINSBURY. Farming Press. 35*s*.

There are many designs and types of housing up and down the country, and as pigs appear to do well in contrasting circumstances, the information collected by the author, and his expert interpretation, make this a very useful book. It is more than obvious that Dr. Sainsbury is not only an authority on the technical aspects of pig buildings, i.e., U. and K values, ventilation rates, etc., but is also very much a pigman at heart.

He does not lose sight of the fact, however, that good houses and good pigs will not in themselves produce the desired result. The application of these principles depends upon an intelligent pigman. How right it is, therefore, that the first diagram in the book is that of a suitable farm cottage, with all modern amenities to accommodate a well-paid employee.

The writer has carefully presented his thoughts and recommendations in sequence form, starting with the needs of the pig and then showing how modern materials can best be used to achieve this end. Provision is made for those to whom capital expenditure is not so serious as well as for the beginner who may find it difficult to raise the necessary money.

It was refreshing to read definite advice in terms of the total number of pigs in one house (not more than 100) and the total number of sows running together in yards (not more than 10). It is these finer points of husbandry which can have such a marked effect on profitability.

Too much consideration is being given in some systems of housing to the reduction of floor space per pig. The result of this has been an increase in tail biting and other vices, which must be to the detriment of converting efficiency; as food costs represent 80 per cent and housing costs 5 per cent or less, this cannot be sound economics. The author's recommendations on these points are consequently all the more pertinent.

I found this a most readable book, and I am sure it cannot fail to be valuable to anyone connected with the pig industry. The style and presentation enable the necessary information to be obtained without difficulty and the method of showing the diagrams, using white lines on blue paper, makes it easy to visualize the actual house or pen.

Those who are thinking of putting up new buildings or making adaptations would do well to consider that an idea put forward in Dr. Sainsbury's book might save hundreds, or even thousands, of pounds.

J.R L.

Biological Research Method (A Practical Guide). H. H. HOLMAN. Oliver and Boyd. 35*s*.

This book deals mainly with biometrics as applied to animal research work: coupled with this are a series of tips and instructions on the conduct of animal experiments. A wide range of biometrical methods, dealing with both parametric and non-parametric data, are covered.

It is somewhat difficult to categorize the book. The author, Dr. Holman, is the Deputy Director of the Veterinary Field Station at Crompton, and there is a very strong bias towards the problems that confront the veterinary or medical research worker. The experimenter concerned with other aspects of animal work is less well catered for; those engaged in plant research will find the treatment of the biometric methods unbalanced for their purposes. Hence the title is rather misleading. Further, there seems to have been some confusion as to the purpose of the book as indicated by the supplementary part of the title. The title page gives it as 'A Practical Guide', the dust cover as 'An Introductory Guide', whilst the Preface designates it as a 'personal guide'.

The text is very variable in quality. Simple truths, some of which must surely be familiar to all graduates in biology, whether research workers or not, get the same length of treatment as much more complicated material. Some passages are to be read in a light-hearted mood; others require careful concentration. The author makes extensive use of the question-and-answer technique of writing in the belief that this simplifies the subject. To some extent this is true, but the method becomes irritating and wearisome when used to excess. Moreover, the excessively simple language sometimes used is not necessarily a means of clarifying a difficult subject. Some quaint computational techniques, intriguing but of limited practical value, serve only to clutter the text. It is also surprising to find no mention of calculating machines as an aid to desk computation.

The book is well laced with anecdotes, often told with a delightful humour; others concerned with the relationships between the research worker and Authority have undertones of bitterness.

For the reasons specified this work cannot be regarded as a text-book or a reference book. It also does not succeed in being an 'Introductory Guide'; the beginner in research will probably find it indigestible. Some 14 years' experience of teaching statistical methods to honours agricultural and biological students have convinced me that the beginner needs a clear cut introduction to a limited number of statistical techniques, appropriate to his type of work, given with the bare minimum of mathematical theory. He needs to become so familiar with the use of these techniques that they become almost second nature to him. When he has reached this point he is in a position to broaden his knowledge of other statistical research tools and to deepen his knowledge of the underlying mathematical concepts.

It is considered that the content of the book is admirable for this purpose. If this had been a clear-cut objective of the author no doubt a different style of writing would have been adopted.

R.H

Veterinary Preventive Medicine. E. G. WHITE and F. W. JORDAN. Baillière, Tindall and Cox. 30*s*.

The advances in knowledge that have greatly increased our ability to prevent and control animal diseases are reflected in this new book. Indeed, preventive medicine is now playing a larger part than ever before in animal production through the development of methods of feeding, housing, grazing and breeding designed to eliminate disease, to reduce its incidence or to minimize its effects.

The general principles involved in the causation, spread and control of disease in domestic animals are dealt with in the first part of the book. The effects of intrinsic factors such as heredity, age and sex and of extrinsic factors such as feeding, housing, climate, management, physical and chemical hazards and living pathogens are all given appropriate consideration.

In Part II examples of the control of different types of disease are given. Here, diseases are classified in eleven groups according to their cause, and the preventive and control measures used for three to five examples from each group are described. While the various conditions are dealt with briefly, and there is no attempt at a comprehensive coverage of all the common disease problems, this section does inform the reader regarding the principles involved in dealing with the wide range of conditions which may affect domestic animals. There is also emphasis on the great variation in the methods which have to be adopted.

Part III refers to human, climatic and geographical factors which influence disease control. Here it is pointed out how circumstances such as political conditions, the wealth of a country, and the nature of frontiers influence the methods adopted to control certain diseases. Brief descriptions are given of the veterinary organization for disease control in the United Kingdom, New Zealand and the Soviet Union. There is also an account of the animal disease control measures adopted by certain international bodies such as the Food and Agriculture Organisation of the United Nations.

Discussion of the incidence of disease, its economic effects and health hazards to man from his domestic animals makes up Part IV.

Simply, clearly and accurately written, this book should leave the reader in no doubt about the importance and complexity of the control of disease in domestic animals. It is a useful contribution to the subject of veterinary preventive medicine and can be recommended to all those interested in animal health, particularly to veterinary surgeons, veterinary students and students of agriculture.

J.S.S.I.

Beekeeping (Oxford Tropical Handbooks). FRANCIS G. SMITH. Oxford University Press. 16*s*.

In this book, which follows closely upon the heels of his more comprehensive 'Beekeeping in the Tropics', Dr. Smith has set himself the task of providing a beginner's guide to the profitable keeping of bees for the production of honey and beeswax, with special reference to the needs of readers in tropical areas where the English language is the medium of technical instruction.

A chapter on the basic natural history of the honeybee colony is followed by instructions for the making of simple hives from readily available local materials—logs of wood, the bark of trees, woven canes, clay and straw. The stocking of such simple hives with swarms, and the removal from them of combs of honey for pressing, is considered by way of an introduction to the modern hive made of sawn timber, with movable combs, and to the more advanced techniques made possible by its use.

The concluding chapters wisely lay emphasis on methods of preparing the end-products, honey and beeswax, in a readily marketable form without loss of their inherent qualities. The end-papers of the book contain conversion charts for English and metric weights and measures, and for degrees Fahrenheit and Centigrade.

In style and choice of words the text is admirably simple and lucid. It is clearly illustrated by many exellent original photographs and drawings.

P.S.M.

British Seaweeds. CAROLA I. DICKINSON. Eyre and Spottiswoode. 25*s*.

The peculiar neglect of this most attractive branch of botany, to be pursued in equally attractive surroundings, must be due largely to the lack of a suitable textbook for amateurs. The cult of seaweed collecting among Victorian ladies of leisure produced some popular books, but these would no longer be considered scientific, even if obtainable, and the classic works of Harvey and Newton are rather daunting for the beginner.

This volume in the Kew Series sets out unashamedly and with considerable success to cater for the amateur, whether student or restless parent coerced into a seaside holiday. At the same time the treatment is scientific, the species are arranged according to taxonomic principles, and an introduction describes the structure, reproduction and life-history of the algae.

There is a section on environment (where a diagram showing typical zonation would have been instructive) and helpful notes on collecting and preserving. The latter might usefully have included some tips on finding the less common species, and there is no mention of photography or trawling, two adjuncts which are within reach of the enthusiast.

For identification, a dichotomous key guides the inquirer to the appropriate genus, wisely no further, and within each genus are described the more conspicuous species which are likely to be found. The chances of wrong identification cannot be ruled out; for instance, among the membranous reds, and because only a selection of the 700 or so British species are dealt with, but the latter problem is inevitable and not too serious.

Each species is described in some detail, together with notes on distribution and interesting peculiarities. The author sometimes seems unnecessarily pessimistic about obtaining certain species, e.g., the Desmarestia. Every species is illustrated either by a black-and-white drawing, or in one of twelve refreshing composite colour plates.

Under commercial uses the agriculturist will find notes on the value of seaweed for manuring (but not as a constituent of feedingstuffs), and the enthusiast is given a recipe for Carragheen blancmange.

The author and editors are to be congratulated on successfully and attractively breaking new ground.

W.E.H.F.

Register of Veterinary Surgeons, 1962. Royal College of Veterinary Surgeons. 30*s.*

Accurate, informative and concise, easy to use and typographically beautiful, this is an exemplary model of what all professional registers should be.

Veterinary surgeons' full postal addresses and telephone numbers are shown. Similarly, comprehensive information is listed, in numerous appendices, showing veterinary staff in municipal employment and in research institutes, cattle breeding centres, universities and animal welfare societies. A copious index facilitates quick reference.

The separate index of 'Geographical Locations' is a splendid achievement. For the United Kingdom and Ireland each county is divided into place-names, below which are listed the names of veterinary surgeons. Veterinary staff of the Ministry of Agriculture (Animal Health Division) are listed within each county under the divisional office address.

Indispensable to anybody concerned with animal production and industry, this *Register* has been devised with consummate constructive skill by Alan Denson. A revolutionary publication which sets a new high standard—doubtless at the cost of stupefying drudgery on the part of the compiler.

Copies can be obtained from the Royal College of Veterinary Surgeons, 32 Belgrave Square, London, S.W.1 (postage 1*s.* 2*d.*).

A.L.

Planning on the Farm. D. B. WALLACE and H. BURR. Report No. 60, Farm Economics Branch, School of Agriculture, Cambridge. 3*s.* 6*d.* (*incl. postage*).

A welter of publications on farm management has emerged in the United Kingdom over the past decade, with the emphasis varying from farm account analysis and the use of efficiency factors to the more sophisticated techniques involving the use of electronic computers.

The objectives of farm management analysis, and the use of associated mathematical techniques, should be the clarification and simplification of complex phenomena, without abandoning accuracy, and the preparation of plans for the more efficient use of resources. *Planning on the Farm* measures up well on this basis. It is aimed at the more progressive farmer and the professional adviser.

The report emphasizes the need for lower costs without increased output and states that economic theory assumes an objective of profit maximization. It overlooks the fact that profit maximization is extremely difficult to achieve in the vast majority of cases without increased output. The report also introduces yet another to the already over-subscribed fund of terms—'common costs'. True, in this report, common costs and fixed costs are not synonymous, but it is unfortunate that the term 'variable' is retained when perhaps 'specific' costs would have been preferable.

The publication shows how farm financial data can be recast into enterprise gross margins and common costs for testing the efficiency of farm organization and for planning purposes. It claims that this is possible because farm costs can be divided into variable (which vary) and common costs which are fixed (but which in fact do vary). Gross margin of an enterprise is defined as the difference between the value of its output and the variable costs incurred. The inclusion of enterprise outputs would add to the value of this report. Examples of how the Gross Margin Analysis system works for arable and livestock farms are included. A section is also devoted to the more complex problems of farming, such as mixed use of grazing, variation in labour rates and differences in soil types.

Although the gross margin concept is as old as the hills, the authors are still to be commended for assembling data on the use of gross margins and common costs in the analysis and reorganization of farming systems.

Patient readers prepared to wade through a most detailed report will find the contents stimulating. The more impatient would be well advised to concentrate in the first place on the foreword, the summary and appendix, which together contain most of the relevant information on the Gross Margin Analysis system. The assiduous reader may be left wondering how the system arose 'from research on farm organization at Cambridge using linear programming and an electronic computer'. *V.H.B.*

Received

Annual Report of the Long Ashton Research Station for 1962. University of Bristol. 15*s.*

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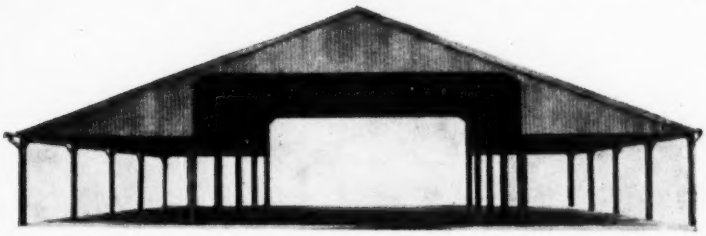

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